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WASH AND CHANGE HOUSES AT AMERICAN MINES

BY

D. HARRINGTON AND J. H. EAST, JR.

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WASH AND CHANGE HOUSES AT AMERICAN MINES[1]

By D. Harrington[2] and J. H. East, Jr.[3]

CONTENTS

	Page
Introduction	4
Acknowledgments	5
State laws applying to wash and change houses	6
Alabama (mines other than coal mines)	6
Arizona	6
Arkansas	6
California	6
Illinois	7
Indiana	7
Iowa	7
Kansas	7
Montana	7
New York	7
Ohio	7
Oklahoma	8
Pennsylvania (bituminous)	8
Pennsylvania (anthracite)	8
Tennessee	8
Utah (coal mines)	8
Utah (metal and nonmetallic mines)	9
Washington (coal mines)	9
Washington (metal mines)	9
Wisconsin	9
Wyoming	9
Survey of wash and change houses at bituminous-coal and lignite mines	10
Location of wash and change houses	11
Construction	12
Floors	12
Walls	13
Ceilings	13
Heating and ventilation	13
Arrangement of wash and change houses	14

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CONTENTS (Continued)

	Page
Facilities for wash and change houses	15
Lockers	15
Showers and washing facilities	16
Toilets and latrines	16
Wash tubs	17
Drinking fountains	17
Benches	17
Wash and change house attendant	17
Fire-fighting equipment	17
Hot water for shower baths	18
Miscellaneous	18
Sewage disposal	19
Septic tanks	19
Open privies	20
Athlete's foot infection	20
Descriptions of wash and change houses	21
Wash and change house - capacity, 1,020 men	21
Wash and change house - capacity, 810 men	23
Wash and change house - capacity, 287 men	25
Wash and change house - capacity, 500 men, working in two equal shifts	28
Wash and change house - capacity, 30 men	30
Wash and change houses in Germany	33
Provision for clothing	33
Route of miner through a wash and change house	33
Dimensions of change rooms	33
Shower rooms	34
Toilet lay-out	34
Illumination	34
Ultraviolet-ray lamps in wash and change houses	34
Solariums	36
Examples of solarium installations	37
Features that should be included in a wash and change house	38
Construction	38
Floors	38
Entrances	38
Arrangement of the interior	38
Interior walls	39
Sewage disposal	39
Ventilation	39
Heating	39
Lighting	40
Washing and bathing equipment	40
Locker rooms	41
Benches	42
Lavatories	42
Drying racks	42
Laundry tubs	43
First-aid room	43

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CONTENTS (Continued)

	Page
Boot washing station	43
Sanitation	43
Caretakers	43
Travelway between mine entrance and wash and change house	44
Carbide storage	44
Foreman's office	44
Conclusion	44

ILLUSTRATIONS

Fig.		Following page
1.	Arrangement of a wash and change house - capacity, 714 employees	14
2.	Arrangement of a wash and change house - capacity, 300 employees	14
3.	Arrangement of a wash and change house - capacity, 600 men, 200 on each shift	14
4.	Arrangement of a wash and change house - capacity, 50 men	14
5.	Arrangement of a wash and change house with hangers for dirty clothes and steel lockers for clean clothes - capacity 448 men	14
6.	Boot showers	14
7.	Boot showers	14
8.	Steel lockers. Note slopong top and open-type metal construction	14
9.	Details of clothes hanger used in a wash and change house in a western State	14
10.	Hangers in a change room. Note the baskets for shoes and other miscellaneous items	14
11.	Hangers in a change room. Note the overhead steel lockers	14
12.	Hangers in a change room and overhead steel lockers.	14
13.	Hangers in a change room. Note the benches	14
14.	Hangers in a change room. Note the hooks for suspending clothes	14
15.	Shower stalls with shower heads	16
16.	Conventional toilet, wash basin, and shower in stalls	16
17.	Semicircular wash fountains	16
18.	Circular wash fountain	16
19.	Semicircular and circular wash fountains	16
20.	Toilet installation	16
21.	Urinal	16
22.	Toilet facilities	16
23.	Bench in a change room. Note the connection for water hose under the bench	16
24.	Sketch showing method of using clothes hangers in a German wash and change house	32
25.	Locker room of a wash house at a large German coal mine. The warm air distributors are on the side walls	32

1893

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ILLUSTRATIONS (Continued)

Fig.		Following page
26.	Locker room of a wash house at a small German coal mine	32
27.	Individual showers in a foremen's shower room at a German coal mine	34
28.	Shower room at a large German coal mine. The temperature of the water is controlled by an attendant	34
29.	Solarium - capactity, 120 persons per hour	36
30.	Arrangement of solarium for group irradiation	36

INTRODUCTION

Mining at its best is not a clean occupation for either surface or underground employees; and this applies alike to coal, metal, and nonmetallic mines. The employees are handling minerals that have been blasted, or borken by some means and are subjected to mineral dust, whether it is coal, quartz, or talc. The employees usually wear clothes specifically adapted to the work in which they are engaged, and frequently these clothes are not suitable for use away from the mine. Many mines are wet, and employees must wear rubber boots, rubber coats, and waterproof hats to remain at least partly dry; and even in relatively dry mines, some parts of the mines usually have water falling from overhead, there are accumulations of water, or the floor or other surfaces are wet or muddy. Some mines are dusty, and the air-borne dust quickly settles on the clothes and body of the miner, especially when he is working in confined areas, or in places that are hot, humid, or poorly ventilated. Most occupations around a coal tipple, anthracite breaker, or a mill at a metal or nonmetallic mine have their own problems of cleanliness as to skin or clothes or both. Mining in any of its phases is inherently dirty work, and the employees dress accordingly while at work.

In the early stages of mining it was the custom for workers to wear their dirty clothes home and change there. This necessitated their going home after work in dirty clothes which were usually damp from perspiration or from contact with wet or muddy materials or surfaces, and in addition to being inconvenient this was a frequent cause of colds, pneumonia, other pulmonary diseases or possible skin ailments. Men working in very wet mines found that it was more satisfactory to change into dry clothes in the boiler room at the mine after work and allow their wet clothes to dry overnight. The mining companies later provided the first of the so-called "dry houses" which were heated but had few, if any, conveniences, such as shower lockers, or latrines. The miners changed into dry clothes after work, but would not bathe or "clean up" until they reached their homes. Later, progressive mining companies provided bathing facilities for the employees, and eventually the present modern wash and change houses were evolved. Unfortunately, many mines still have no bathing accomodations, and many have only makeshift accomodations.

Considerable resistance to the use of company-owned wash and change houses still exists in many localities. This is probably based on the

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lifelong habit of changing work clothes at home, or because the personal effects of the employee left in the wash and change house are not guarded against theft. Opposition to wash and change houses from this latter cause seldom exists at a modern, well-operated installation.

Health is man's greatest asset and should be guarded at all times. The physical effort that a miner must exert each day need not be detrimental to his health if he does not overtax his strength and does not fail to give as much attention to his body as is given a piece of machinery that is working constantly. No mechanism works properly when clogged with dirt. In mining, the strenuous work causes the miner to perspire freely. If the pores of the skin are clogged with mineral dust, this source of elimination of the body waste is stopped, and the body's resistance to disease is lowered. Traveling considerable distances in clothes damp with perspiration, or wet from contact with materials and surfaces, and with the body resistance lowered after a day of arduous effort is an invitation to pulmonary ailments. This is especially true in winter weather. A shower bath at the end of a work shift, with subsequent changing into dry clothes, goes far toward decreasing the hazards from this source.

The present trend in mining is away from the company-owned towns or "camps" of a few years ago, inasmuch as the employees prefer to live away from the mines and to gather in privately owned communities, traveling to and from work by automobile or bus. Some mining districts have modern towns and cities in which practically all mine employees of the area live. In these places a miner is seldom seen dressed in working clothes on the city streets. There is little, if any, opposition to the use of wash and change houses. In fact, wash and change houses become almost a "must" if a sufficient supply of mine labor of a suitable type is to be maintained.

In an effort to attract miners and to reduce the labor turn-over and labor strife, as well as to improve the health of the miners and thus reduce the absenteeism, many mining companies have expended relatively large sums in the construction, equipment, and maintenance of modern wash and change houses. In some instances, many of the miners have not taken advantage of the facilities provided because of theft of personal effects, fear of contracting contagious diseases, especially "athlete's foot", and failure to maintain cleanliness in the wash house, as well as other reasons. The personal advantages that accrue to a worker in using a properly operated and equipped wash and change house and the improved health aspects should overcome this opposition eventually. The wash and change house should be kept up-to-date and well-maintained at all times if it is to fulfill the functions that are involved in the original installation.

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STATE LAWS APPLYING TO WASH AND CHANGE HOUSES

The laws and regulations applying to wash and change houses are inadequate in most States, while in a few, the laws specify the type of construction of the buildings, temperature that must be maintained, maximum number of men for each shower bath, and other pertinent details. The coal-mining laws are usually more explicit in this regard than the laws relating to metal and nonmetallic mining.

The laws and regulations relating to wash and change houses of several mining States are abstracted below:

Alabama (Mines other than coal mines)

Change houses must be provided convenient to mine openings and must have adequate heating and lighting facilities. The change houses must be equipped with shower baths and must be provided with hot and cold water; one shower bath is required for each 15 men on a working shift. It is recommended that working clothes either be elevated, or separate rooms should be provided for working and street clothes. Mines employing less than 10 men and without suitable water available are exempt from the shower-bath requirement provision, but washing and bathing facilities must be provided.

Arizona

Heated wash and change houses must be maintained contiguous to every mine employing 25 or more men. One shower bath and adequate washroom facilities must be provided for every 25 men. The wash and change house must be kept clean and in a sanitary condition.

Arkansas

Wash and change houses must be provided at mines employing 10 or more men. The buildings must be suitable, conveniently located, equipped with lockers and benches, and provided with light, heat, and cold and hot water. The laws provide specifications for the wash and change houses and provisions for onforcement and upkeep.

California

Wash and change houses must be conveniently located and provided with heat and light. The change house must be available at all times when men are going off or coming on shift, and at least one shower must be provided for every 15 men on a shift working in the mine. The wash and change house must be kept reasonably clean and sanitary. The regulations recommend that the working clothes be elevated or that separate rooms be provided for working and street clothes. Mines employing fewer than 10 men are exempt from the shower bath provision if no suitable water is available, but washing and bathing facilities must be provided.

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Illinois

Wash and change houses shall be provided; they must be adequate, suitably equipped with lockers or hangers, supplied with hot and cold water, and heated. They must have a sufficient number of showers. Dressing space of 7 square feet per man must be provided. The law provides for enforcement and for maintenance. This applies to all mines.

Indiana

Wash and change houses must be provided at all mines on the petition of 20 employees, or one-third the number of employees if less than 20. The building must be separate from the boiler or engine room and furnished with wash bowls, shower baths, lockers or hangers, and cold and warm water. At least 7 square feet of dressing space per man must be provided as well as adequate heat, light, and ventilation. The law provides penalties for violation and for misuse.

Iowa

The operator must provide "adequate facilities" for wash and change houses at mines employing more than 20 persons.

Kansas

A wash and change house must be available at all mines. The building must be suitable, conveniently located, and equipped with lockers or hangers, benches, and showers. Light, heat, and hot and cold water must be provided. The wash and change house must be kept in good order. One shower must be provided for each 15 employees. The law does not apply to mines operated on the longwall system, to any mine in excess of 600 feet in depth, or to any strip mine.

Montana

The operator shall provide a wash and change house at mines where more than 12 miners are employed. The building must be suitable, not a boiler house or engine house, and must not be more than 800 feet from the mine entrance. It must be heated, lighted, kept clean and in good order, and provided with hot and cold water, and washing and locker facilities for each person. The law provides penalties for violation or misuse.

New York

A wash and change house must be provided for each mine employing 25 men underground, and it must be equipped with heating and lighting facilities. Sufficient warm water should be available. It must be free of cost to the workers and open at all hours.

Ohio

The operator shall provide a wash and change house where 10 or more employees request one. The building shall be convenient to the mine entrance

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and shall have adequate wash rooms. It shall be lighted, heated, and provided with warm and cold water and washing facilities. The law provides for penalties in case of noncompliance.

Oklahoma

A wash and change house shall be provided at all mines. The building shall be suitable, of sufficient size to accommodate all employees, and convenient to the mine entrance. Hangers or lockers, proper light, heat, hot and cold water, and showers shall be provided. The wash and change house shall be sanitary and maintained in good order.

Pennsylvania (bituminous)

A wash and change house shall be provided for wet mines on the petition of 10 employees to the mine inspector; the 10 employees must work in wet places. The building must be suitable for employees working in wet places and must be convenient to the mine entrance. It must be maintained in good order, and properly lighted and heated. Hot and cold water and washing facilities must be provided. The cost of operation must be paid by the operator. The law provides penalties for the violation and for the misuse of the wash and change house.

Pennsylvania (anthracite)

The operator shall provide a wash and change house on the written request of 20 or more men employed in any mine. The building must be suitable, not an engine or boiler house, and must be convenient to the mine entrance for the purpose of washing and changing clothes. It must be maintained in good order, and properly lighted and heated. Cold and warm water and washing facilities must be provided. Penalties are provided for the violation of the law and for the misuse of the wash and change house.

Tennessee

A wash and change house must be available for mines employing 50 or more men. The building must be suitable and convenient to the majority of the employees. It must be equipped with lockers or hangers, benches and seats, proper lights, and heating arrangements. Hot and cold water and showers must be provided. The floor space must be sufficient for all employees using the wash and change house; one shower must be provided for each 15 persons. The wash and change house must be maintained in good order. The law has specifications for the construction and equipment. The law provides for enforcement and provides penalties for violation and misuse.

Utah (coal mines)

The operator shall provide a change house with bathing facilities within a reasonable distance from the mine portal and tipple for all mines employing 10 or more men. At least 7 square feet of floor space must be available for each employee regularly using the change room, and lockers or hangers must

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be furnished. One shower for each 10 men on a regular shift and one toilet for each 100 men must be provided. The wash and change house must be well lighted, kept sanitary, and provide protection against athlete's foot. The operator may charge for the use of the wash and change house.

Utah (metal and nonmetallic mines)

A wash and change house is required for all mines; one shower must be provided for each 25 men. The building must be located convenient to the principal mine entrance when practicable, maintained in good order, and provided with hot and cold water and washing facilities. A suitable place must be available for each person to place his clothes. Mines employing less than 25 men and with no suitable water available on the property are exempt, but employees must be provided with washing and bathing facilities.

Washington (coal mines)

The operator must provide a wash and change house on the petition of 60 percent of the employees. A charge of $1.00 per month may be made. The building must be suitable and convenient to the mine entrance. The floor space must be sufficient to accommodate the users. The specifications of construction of the building are in the law. Lockers or equivalent must be furnished; and one shower for each 20 men on a shift must be provided. The wash- and change-house attendant may be paid by fee. The section of the law does not apply where fewer than 20 men are employed or to nonproducing mines.

Washington (metal mines)

One shower bath is required for every 25 men, as well as adequate washing facilities. The heated wash and change house must be maintained contiguous to every mine employing 25 or more men.

Wisconsin

Change houses are required for drying clothes of persons employed in or about mines. They must have adequate heat and lighting, must be cleaned daily, and kept in a sanitary condition. A temperature of not less than 70° F. must be maintained at all times.

Wyoming

A wash and change house must be provided at mines employing 20 or more miners. The building must be suitable and convenient to the mine entrance. The wash and change house must be provided with lockers and hangers, benches or seats, proper lighting and heating, showers, hot and cold water, and maintained in good order. Floor space must be sufficient for the miners or others using it. The specifications include the floor construction and equipment; one shower is required for each 15 employees. The wash and change house is not required unless 60 percent of the employees make a written request. No charge may be made for the use of the building. Penalties are provided for the violation or misuse of the wash and change house.

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Among the States that, so far as is known, do not have laws and regulations requiring wash and change houses at mines are Colorado, Kentucky, New Mexico, North Dakota, Virginia, and West Virginia.

SURVEY OF WASH AND CHANGE HOUSES AT BITUMINOUS-COAL AND LIGNITE MINES

A survey of the wash and change house facilities at 2,203 bituminous-coal and lignite mines was made in 1946; only those mines employing 25 or more men were included in the survey. The following salient facts were disclosed by the survey:

1. Forty-three percent of the 2,203 mines investigated in 27 State have wash and change houses.

2. Fifty-four percent of the total number of men employed in the 2,203 mines have access to wash and change houses.

3. The employment in the 2,203 mines totaled 354,555 men.

4. A total of 61,192 men, or 17 percent, worked in 1,127 mines tha employ 25 to 99 men.

5. A total of 293,363 men, or 83 percent, worked in 1,076 mines th employ 100 or more men.

6. 938 wash and change houses are provided at the 2,203 mines included in the survey.

7. 593 wash and change houses, or 63 percent, are at mines employing over 100 men.

8. The employment at the 593 mines having wash and change houses totaled 173,864 men, or 59 percent of the men were employed in mines having 100 or more men.

9. Illinois has wash and change houses at 96 percent of the 178 coal mines surveyed.

10. Pennsylvania (bituminous), Kentucky, and West Virginia, in the Appalachian district, have 1,270 mines employing 25 or more men and only 28 percent of these mines have wash and change houses. These three States have 58 percent of the total number of coal mines in the United States and employ 64 percent of the total number of men in the bituminous coal and lignite industry.

11. The survey of the mines of West Virginia included 603 mines, of which 273 employed 25 to 99 men and 330 employed 100 or more men. Only 106 mines, or 17 percent, have wash and change houses. The total employment at the 603 mines was 99,677; of 28,648 men, or 29 percent, have access to wash and change house facilities.

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12. The survey of the mines of Colorado included 63 mines employing 25 or more men, and with a total employment of 5,796. Of these 63 mines, 38 have wash and change houses; hence 60 percent of the mines surveyed have these facilities, and 4,184 men, or 72 percent of the total employment, are employed at mines having wash and change houses. However, insofar as known, the laws of Colorado do not require wash and change houses at mines.

13. The following tabulation shows the number of mines surveyed in certain States, the employment at these mines, the number of wash and change houses, and the number of employees having access to these facilities:

Summary, by States, of the survey of wash and change houses at bituminous-coal and lignite mines

State	Number of mines	Employment	Number of wash and change houses	Number of employees at mines having wash and change houses	Percent of total employment
Arkansas	32	2,288	30	2,128	96
Alabama[1/]	81	17,770	44	12,134	69
Colorado[1/]	63	5,796	38	4,184	72
Illinois	178	31,804	171	31,452	99
Indiana	77	9,801	42	6,790	69
Iowa	28	1,774	11	1,046	59
Kansas	13	1,134	5	413	38
Kentucky[1/]	235	44,413	82	17,853	40
Maryland	13	1,082	0	0	-
Missouri	28	1,563	7	435	28
Montana	10	1,569	9	1,428	90
New Mexico[1/]	15	1,857	12	1,748	94
North Dakota[1/]	8	524	8	524	100
Ohio	173	21,186	77	16,861	80
Oklahoma	26	1,963	18	1,557	80
Pennsylvania	432	81,624	170	46,561	57
Tennessee	49	5,331	29	3,931	74
Utah	19	3,143	13	2,413	77
Virginia[1/]	61	13,450	28	7,992	59
Washington	18	1,433	12	1,065	74
West Virginia[1/]	603	99,677	106	28,648	29
Wyoming	27	4,890	16	3,492	71
Total of entire survey	2,203	354,555	938	193,102	54

1/ The establishment of wash and change houses at mines not required by State law.

LOCATION OF WASH AND CHANGE HOUSES

Generally, too little attention has been given to the sites for wash and change houses in respect to the mine entrances. A site often is

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selected because of favorable topography, convenience to a boiler plant, or almost any reason other than for the convenience of the underground employees.

During the colder months, the temperature of most mines is considerably warmer than the air outside the mine. The miner is dressed for underground work, and his clothes are frequently wet or damp, making it very undesirable to be required to walk a considerable distance to wash and to change to street clothes. This is particularly true at the mines in wintertime or at high altitudes at any season of the year.

Wash and change houses should be placed as near the collar of the shaft or portal of a tunnel as practicable. Some mines provide covered walkways from the mine entrance to the wash and change house; other mines have an underground connection between the mine and the change house. In the Lake Superior mining district, a substantial percentage of underground mines have adopted the latter plan. In Germany, the underground connections between the mine shafts used in hoisting men and the wash and change houses were used as bomb shelters and as a means of concealment for the miners going on or coming off shift. Generally, the man-trips at shafts are loaded and unloaded at this underground connecting passage rather than at the collar of the shaft or portal of the tunnel.

The advantages of the underground passageway are obvious, and some mining companies believe an appreciable reduction in absenteeism in winter resulted, as miners were unwilling to walk to the change houses in wet clothes.

CONSTRUCTION

It is desirable to have wash and change houses of fireproof, or at least fire-resistant, construction. Many wash and change houses constructed of combustible materials have burned, causing the employees to lose either their working clothes or street clothes. The fear of losing their personal possessions by fire has caused the employees at many mines to refuse to use the poorly constructed wash houses that were provided.

Commonly used materials of construction for up-to-date wash and change houses include brick, tile, concrete, or possibly sheet steel on a wooden framework; the latter is usually of a makeshift type, although it can be made reasonably well. Wooden construction throughout is used to a much less extent than other materials in the newer buildings, and it should not be used except for unusual conditions.

Floors

The floors should be constructed of concrete, with a slight slope toward properly located water drain pipes to permit frequent washing of the floors with a water hose. Some wash houses are constructed with a floor slope of one-fourth inch to the foot.

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Floors of change houses frequently introduce a slipping hazard, particularly for employees wearing rubber boots. It is customary to roughen the surface of the cement slightly or to sprinkle sand or carborundum over the cement before it sets.

Sometimes the floors of the locker rooms for street clothes are made by covering the concrete with melted asphalt and sprinkling sand on it, or rubbing with sand, while the asphalt is still warm. This type of floor construction is reported to have the advantage of being warmer to the feet, without joints, and easy to clean and repair.

Walls

The walls of a wash and change house should be smooth and preferably of a light color to give better diffusion of the light. The walls should be easy to clean to a height of at least 7 feet. Tile is commonly used in the more modern change houses.

Ceilings

The ceiling of a wash and change house should be insulated, particularly in climates having wide variations in temperature, as this materially assists in maintaining an even temperature in the room. Carefully controlled ventilation prevents most, if not all, of the formation of moisture on the ceiling and consequent dripping water.

HEATING AND VENTILATION

In most climates, the heating and ventilation of wash and change houses should be considered together; both of these subjects are of extreme importance in well-arranged change houses and too often are inadequate.

Mechanical devices utilizing heated air are the most desirable and positive way of securing uniformly satisfactory heating and ventilation conditions in wash and change houses in climates having widely varying temperature conditions. Many mining and industrial establishments have adopted this method in the more modern installations, especially when a large number of employees utilize the wash- and change-house facilities.

Wash and change houses at mines are subject to odors from the working clothes while drying and to dust falling from the clothes when dry; both become obnoxious if means are not taken to overcome them. The underground work clothes of miners are generally dirty and not infrequently muddy when removed; they are damp with perspiration, and as a rule work clothes are not changed or laundered frequently. The clothes while drying are odorous, and the atmosphere in the room soon becomes almost intolerable if adequate ventilation is not provided. Some of the dirt on the clothes falls to the floor on drying, resulting in considerable dust which should be removed by ventilation as well as frequent cleaning of the room. When it is possible, heated air should be admitted into the room from near the ceiling and removed from the floor if the dust is to be eliminated or reduced. Care should be taken to avoid creating drafts, especially from shoulder height to the floor.

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Most of the wash and change houses at American mines, in point of numbers, are provided with natural ventilation obtained by cupolas or windows in the roof. The natural ventilation can be made fairly satisfactory if the openings are of sufficient size and spaced to provide a cross ventilation, which will actually change the air in the room in a reasonable time. This method is likely to accentuate the dust condition; however, it is widely used and gives fairly satisfactory results, except in regions where high winds prevail.

The quantity of air required for correct ventilation of wash and change houses has not been established as a standard by any authority, so far as is known. At one western metal mine, 8,000 cubic feet of air a minute is exhausted from the change house, and it is reported that a complete change of air in the room containing the work clothes takes place every 3 minutes.

The proper heating of a wash and change house is of prime importance, especially during the winter. The heating should be as nearly uniform as it is possible to attain, and the general room temperature should not be less than 70° F. A higher temperature is desirable, although temperatures above 85° F. are undesirable.

Wash and change houses are heated by many methods, ranging from a coal-fired stove at some small, remote mines to steam- or hot-water-heated blower-type units at more modern installations.

One of the common hazards found at the older wash and change houses is the unguarded steam or hot-water pipes within reach of a person's body. Steam pipes, hot-water pipes, or other sources of heat should be guarded effectively to prevent personal contact with them.

Some modern wash and change houses use blower-type unit heaters which blow the heated air into a given area; the heaters are of the type frequently seen in industrial plants. There are no contact hazards with this equipment, but unless sufficient numbers are provided and carefully placed the room is not uniformly heated as with normal steam or hot-water heating.

ARRANGEMENT OF WASH AND CHANGE HOUSES

The arrangement of the facilities in wash and change houses is by no means standardized and is largely a matter of choice and cost, in accordance with the requirements of the individual mine. The general practice at most large mines and many smaller ones is to provide separate rooms for the miner's work clothes and street clothes and to place the bathing facilities between the two rooms. The miner, on coming off shift, removes his dirty clothes in the room provided, takes a shower, and proceeds to the locker room containing his street clothes. With this arrangement, the miner is not as likely to rub against others still in their working clothes This is particularly desirable in mines where the materials mined or handled are very dirty such as in the iron mines and most coal mines. The street exits are generally from the street clothes locker room.

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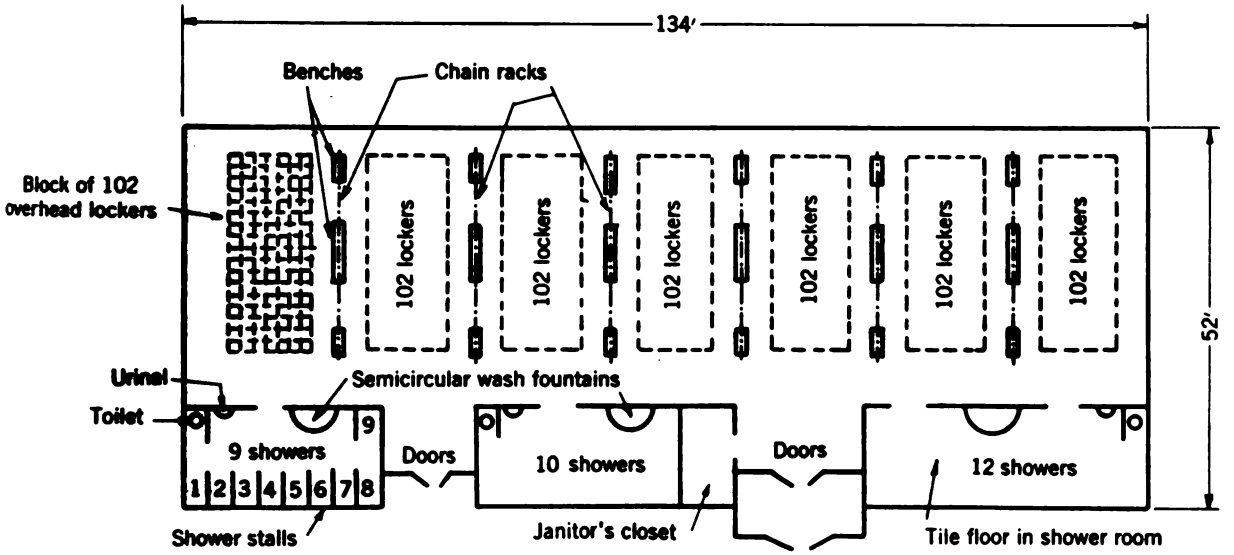

Figure 1. - Arrangement of a wash and change house - capacity, 714 employees.

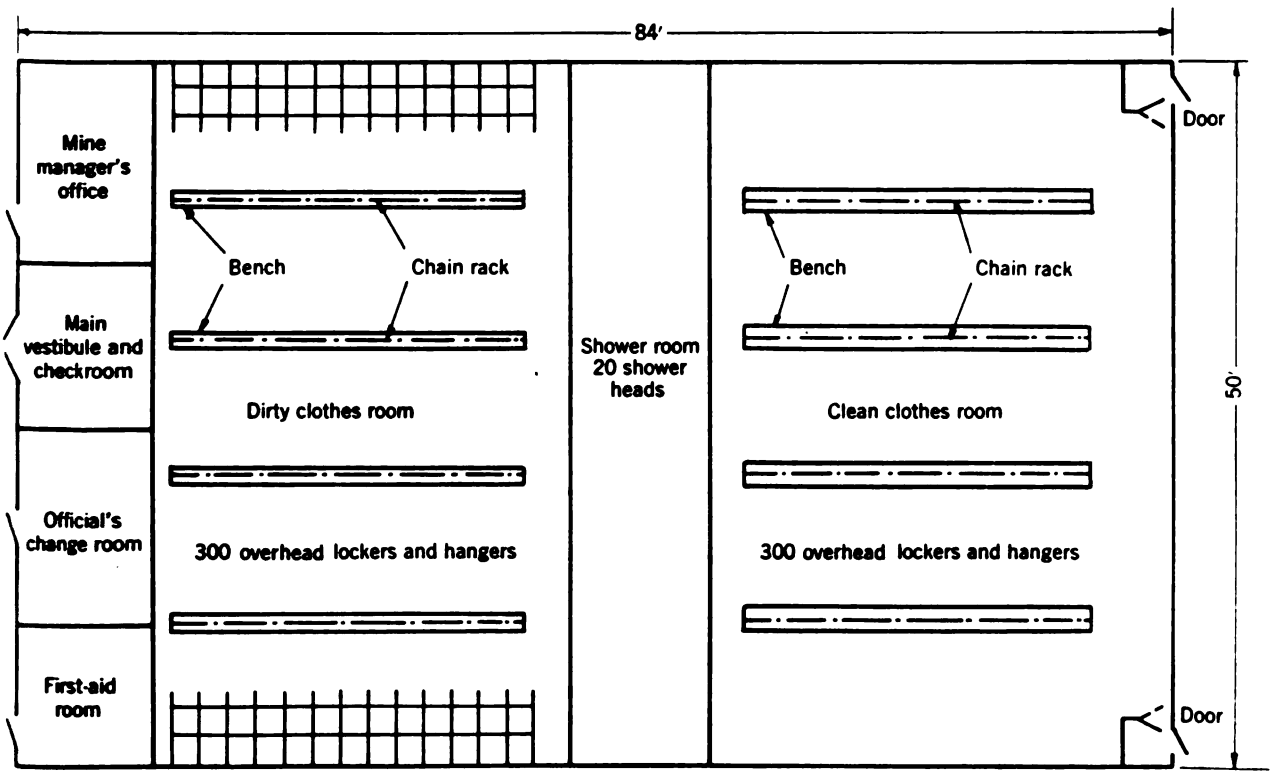

Figure 2. - Arrangement of a wash and change house - capacity, 300 employees.

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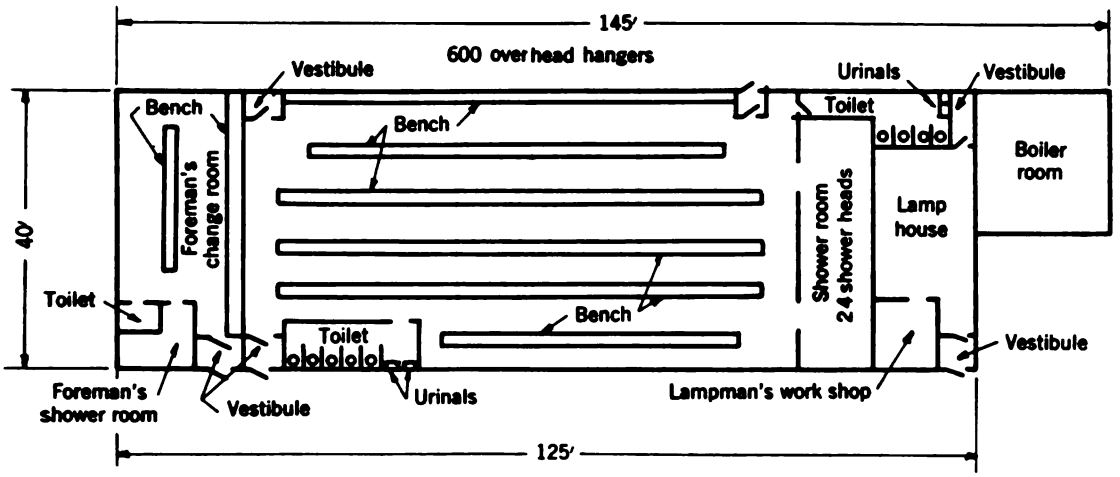

Figure 3. - Arrangement of a wash and change house - capacity, 600 men, 200 on each shift.

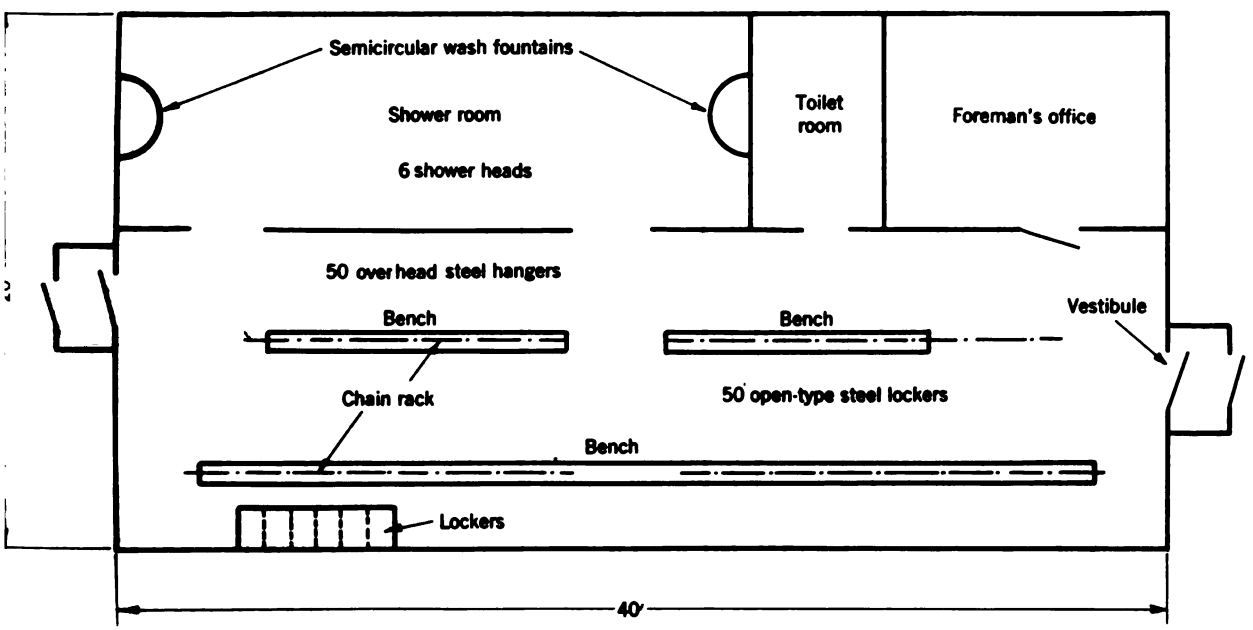

Figure 4. - Arrangement of a wash and change house - capacity, 50 men.

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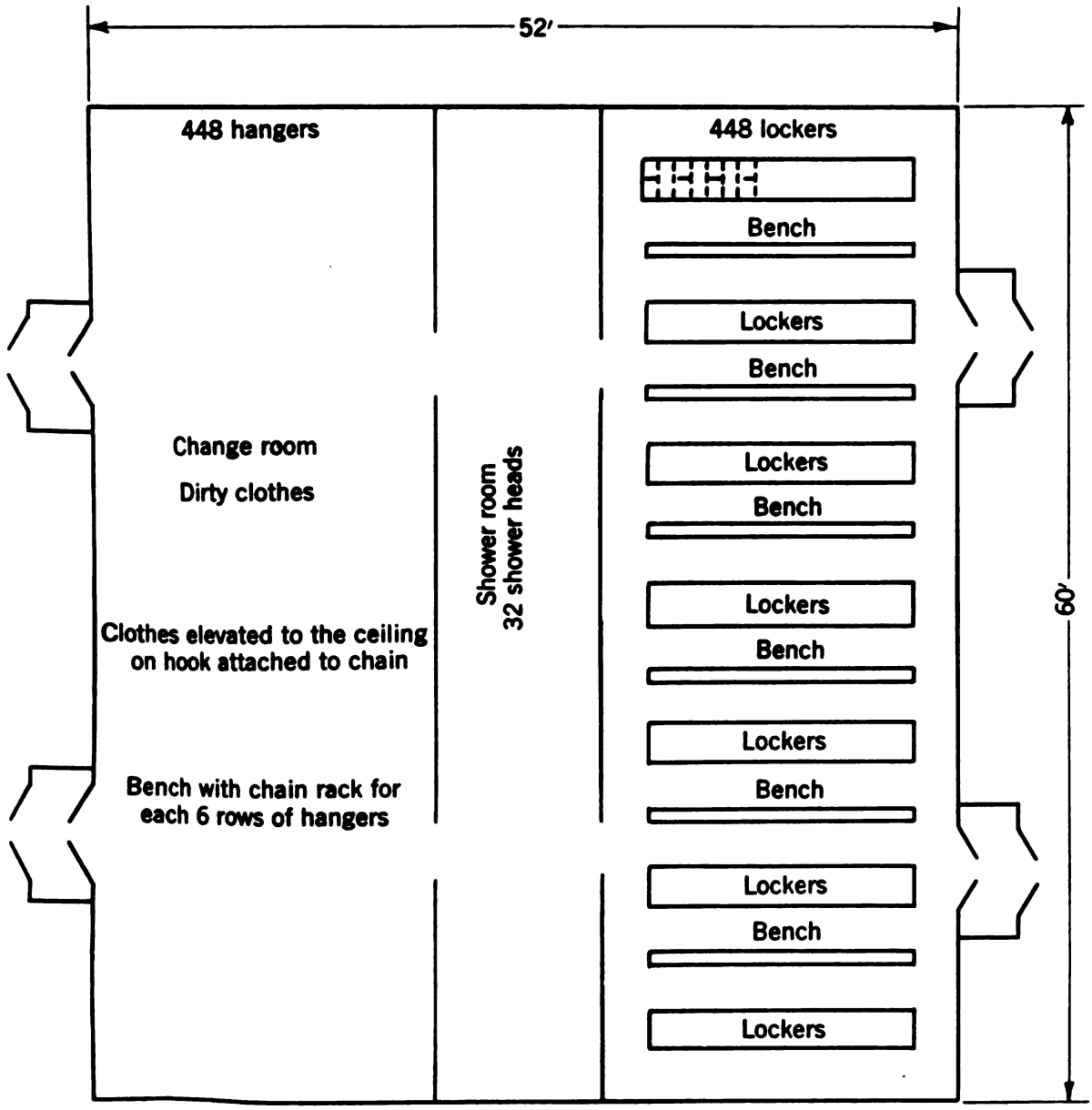

Figure 5. - Arrangement of a wash and change house with hangers for dirty clothes and steel lockers for clean clothes - capacity, 448 men.

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Figure 6. - Boot showers.

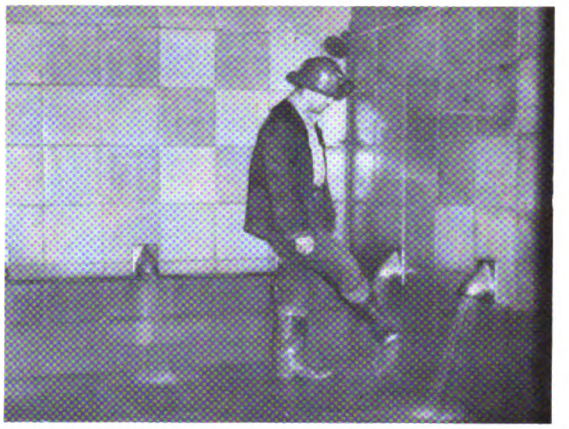

Figure 7. - Boot showers.

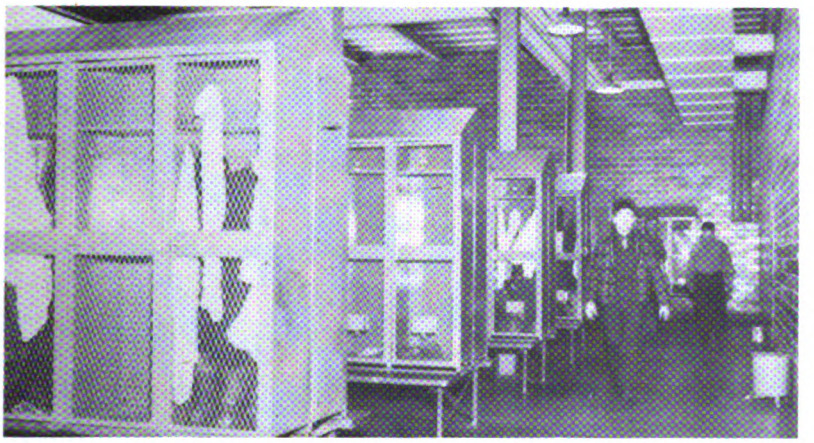

Figure 8. - Steel lockers. Note sloping top and open-type metal construction.

Figure 10. - Hangers in a change room. Note the baskets for shoes and other miscellaneous items.

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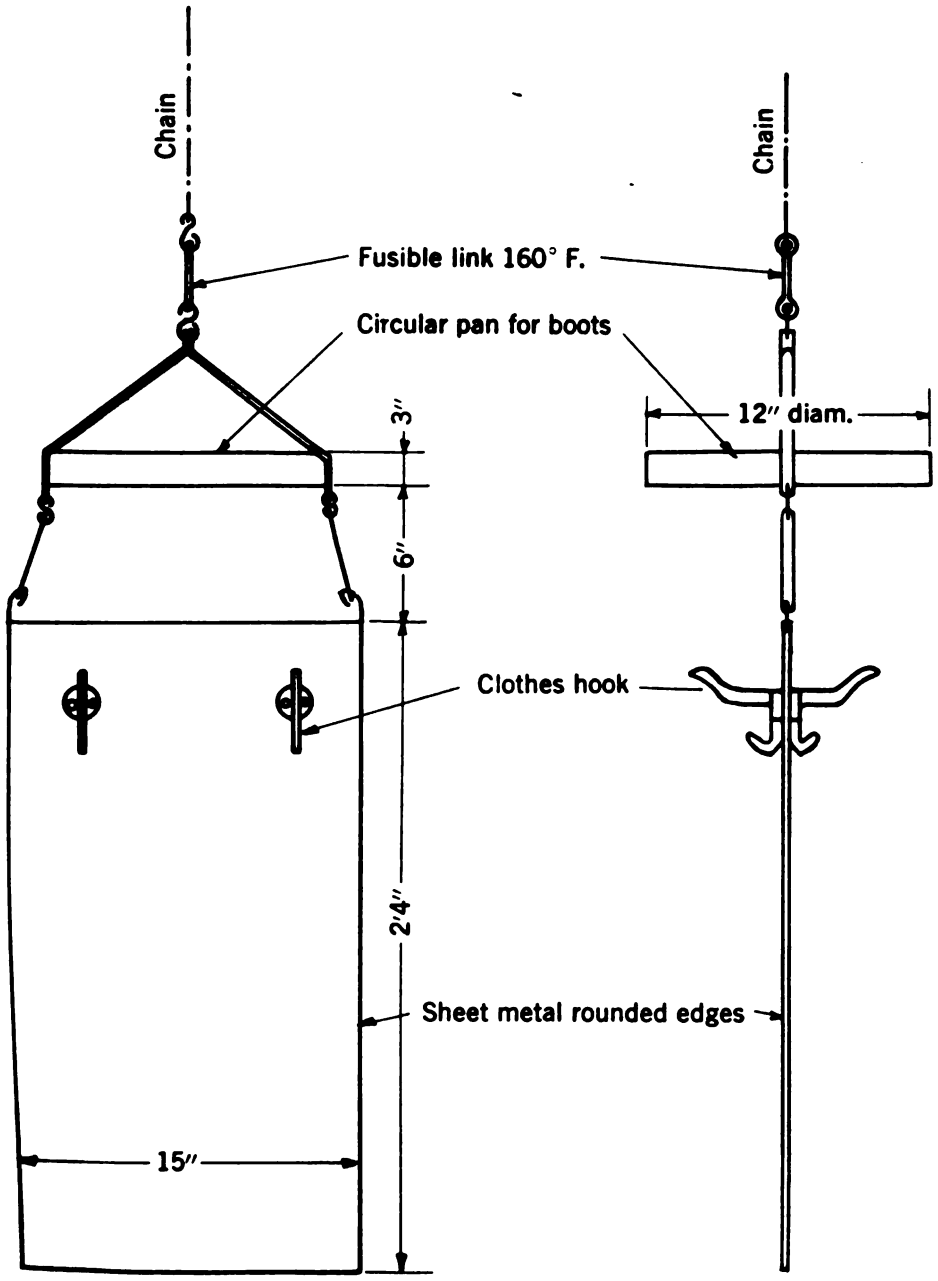

Figure 9. - Details of clothes hanger used in a wash and change house in a western State.

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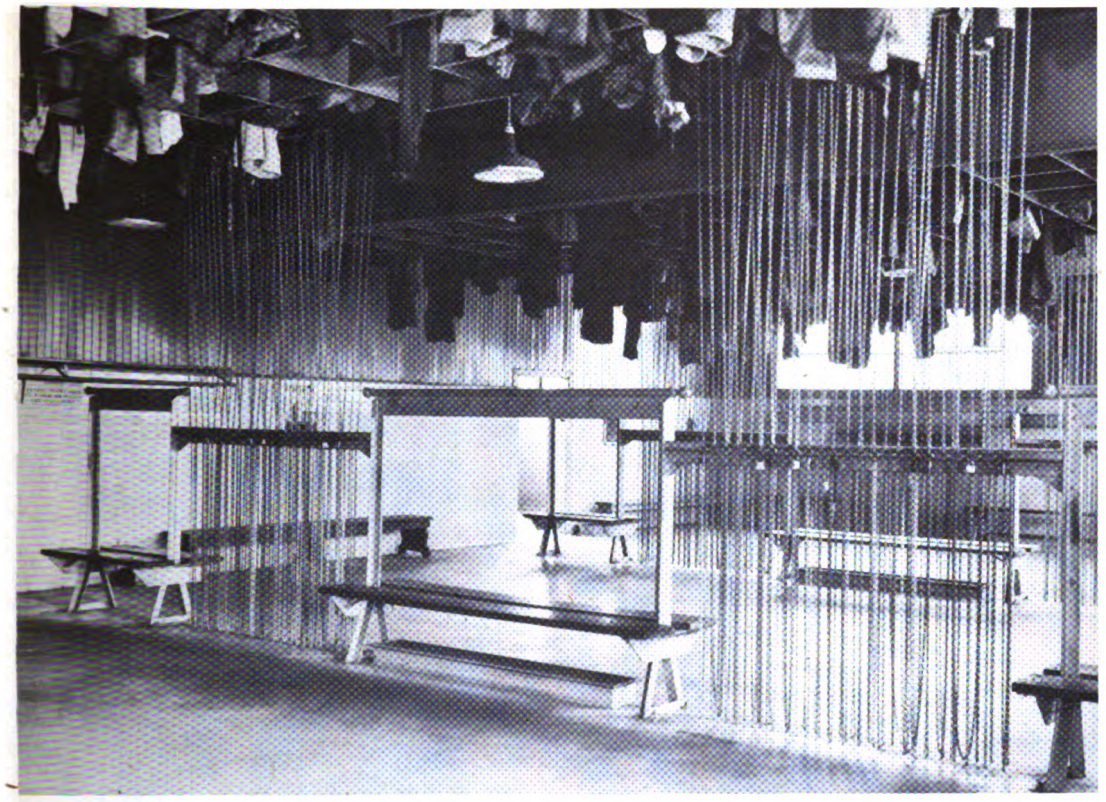

Figure 11. - Hangers in a change room. Note the overhead steel lockers.

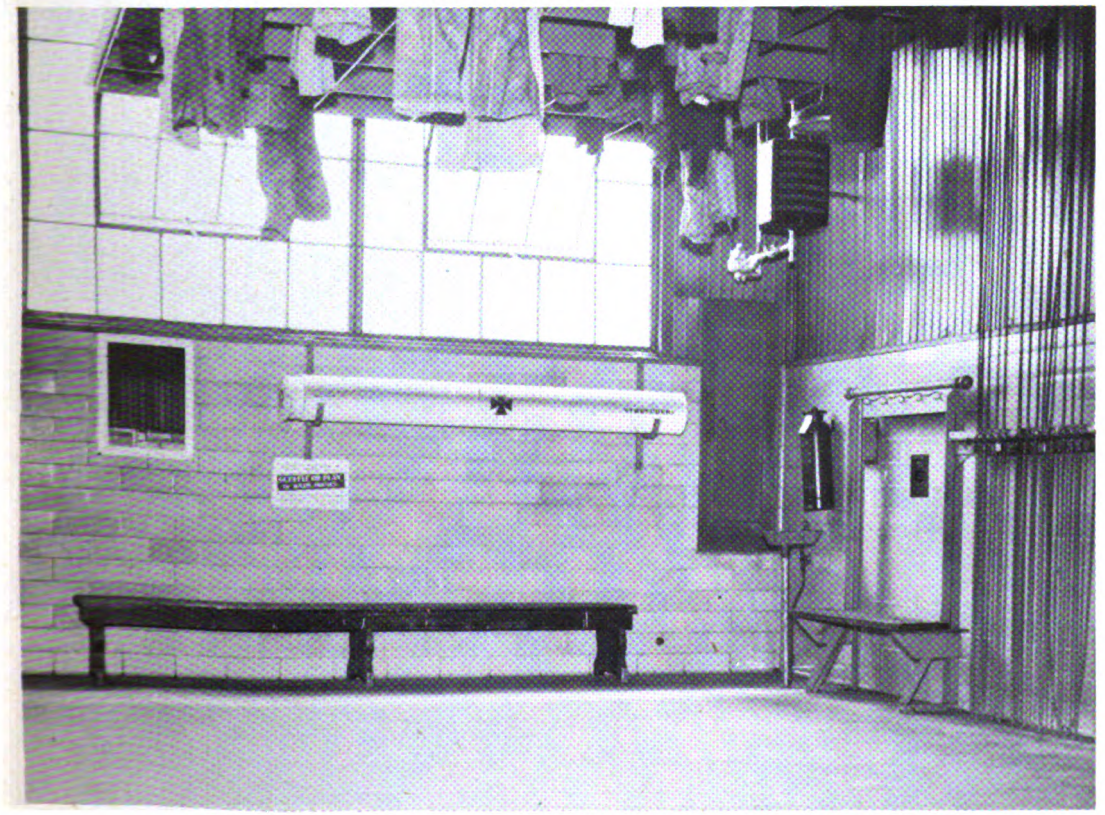

Figure 12. - Hangers in a change room and overhead steel lockers.

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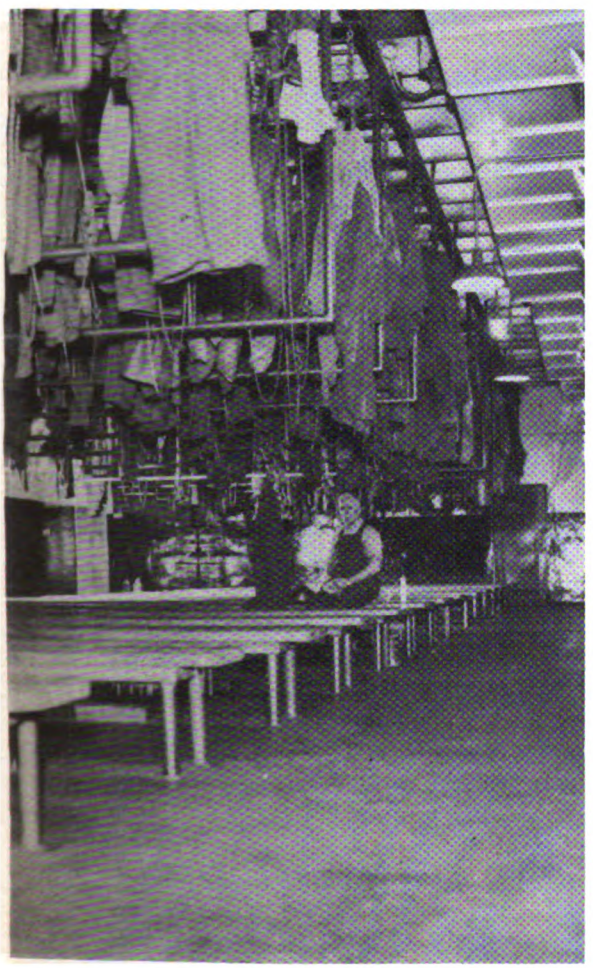

Figure 13. - Hangers in a change room. Note the benches.

Figure 14. - Hangers in a change room. Note the hooks for suspending clothes.

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Another arrangement that requires less space, but is not as satisfactory, is to have the shower baths in the central part of the room or in a corridor, with the work clothes on one side of the showers and the street clothes on the other side. The miner, after taking a shower, passes on to the clean-clothes lockers.

There are many variations from the two arrangements mentioned above, and no attempt is made to describe them as a general class. Figures 1, 2, 3, 4, and 5 show the arrangement of typical wash and change houses.

Some mines provide floor gratings at the mine entrance to the wash and change house for the miner to scrape the mud from his boots before actually entering the room; other mines provide boot showers to wash the dirt and mud from the boots (figs. 6 and 7). The refuse from the boots is washed into a sewer or other outlet.

FACILITIES FOR WASH AND CHANGE HOUSES

Lockers

The lockers in most modern wash and change houses are of steel construction, readily kept clean, and easy to ventilate. However, the lockers in many of the older wash and change houses are made of wood, are difficult to clean, and seldom provide for ventilation.

Steel lockers should be of open metal construction (fig. 8) and of adequate size, not less than 16 inches wide and 12 inches deep. The height depends on local conditions but ranges from 3 to 5 feet. Some companies provide the steel lockers with combination locks, but the usual practice is to use key-type locks. The lockers should have steeply sloping tops to prevent the storage of rubbish or discarded materials; the sloping top also facilitates cleaning.

Some mining companies have installed means of elevating the miners' street clothes near the ceiling, using hooks and chains, in place of lockers (fig. 9). Baskets are provided for shoes and personal effects of the miner (fig. 10). The chains are locked to prevent anyone except the owner from tampering with the clothes.

The use of lockers for mine clothing, particularly when the clothes are likely to be damp or wet, is not desirable. Modern practice is to elevate the work clothes near the ceiling of the room, using hooks and lines over pulleys (figs. 11, 12, 13, and 14). The warmest air is at the ceiling, and the wet clothes dry better there than in lockers. If lockers are used for mine clothes, each employee should be provided with two lockers, one for street clothing and one for mine clothes. In some cases fusible links are placed in the chains so that in case of fire the clothes will fall to the floor and probably suffer minimum damage.

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Drying racks are used at some mines to allow the miners to hang their clothes; this is generally not as satisfactory as raising the clothing to the ceiling.

Baskets or trays for mine shoes or boots are provided at most installations where the clothing is elevated (fig. 10).

Showers and Washing Facilities

The number of showers required in wash and change houses is, in many instances, regulated by law and ranges from 1 shower for every 10 men employed on a shift to 1 for every 25 men. An average in the United States would probably be 1 shower for every 15 men employed on a single shift.

Most modern wash and change houses at larger mines have shower stalls with one shower head in each stall (fig. 15); however, many shower rooms have the shower heads spaced at regular intervals along the wall of the room without a partition of any kind. The principal objection to the latter system is the lack of protection from splashing water from one shower into another, and the increased likelihood of considerable "horse play" while the baths are being taken; moreover, there is much difficulty in controlling drafts in the open-room system.

In Europe, some of the large mines have shower rooms with numerous shower heads placed in the ceiling of the room. The temperature of the water is regulated by an attendant, and individual showers are not provided. Group bathing is not practiced in the United States so far as is known.

At a large Canadian mine, the showers are installed in a long, narrow passageway; the water sprays are warm at the entrance and cold at the other end. A larger room with warm water is available for the men to apply soap before entering the shower baths.

The temperature of the water for the shower is generally regulated by a safety mixing valve that prevents the miner from inadvertently turning on extremely hot water that might cause serious burns.

Facilities for washing the hands and face before entering the shower baths are desirable, and in some States are required. The ordinary hand wash bowl is the most commonly used type for this purpose (fig. 16), but the circular or semicircular wash fountains are increasing in favor (figs. 17, 18, and 19).

Bath tubs and swimming pools in place of showers are not regarded as hygienic when a large number of employees use them; however, they are provided at some mines because some types of foreign laborers demand them.

Toilets and Latrines

A sufficient number of toilets and latrines should be provided in every wash and change house. The number of these installations considered necessary for a given number of employees varies greatly. The Utah law requires

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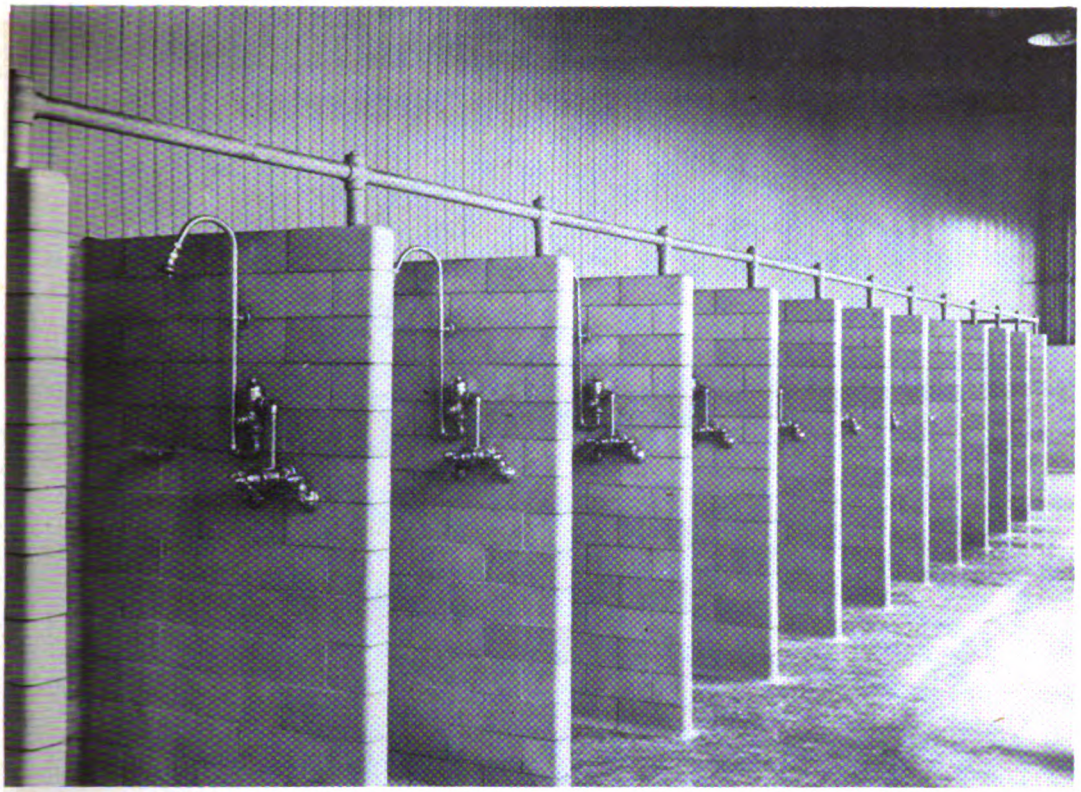

Figure 15. - Shower stalls with shower heads.

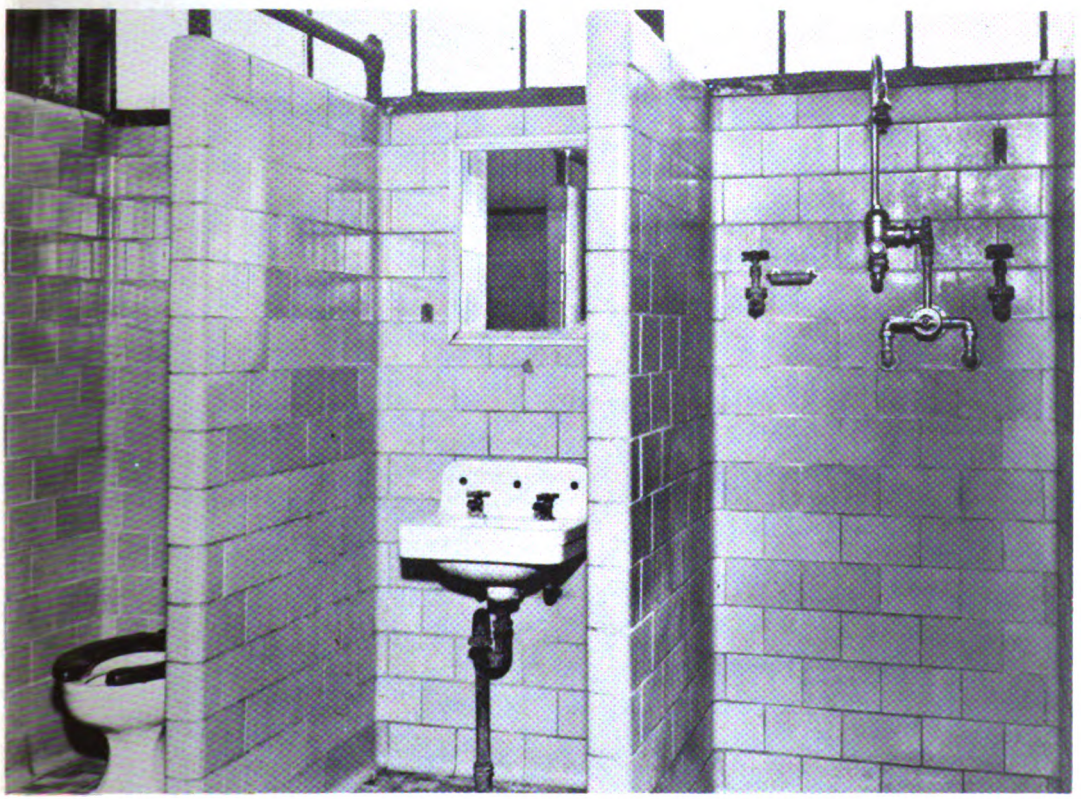

Figure 16. - Conventional toilet, wash basin, and shower in stalls.

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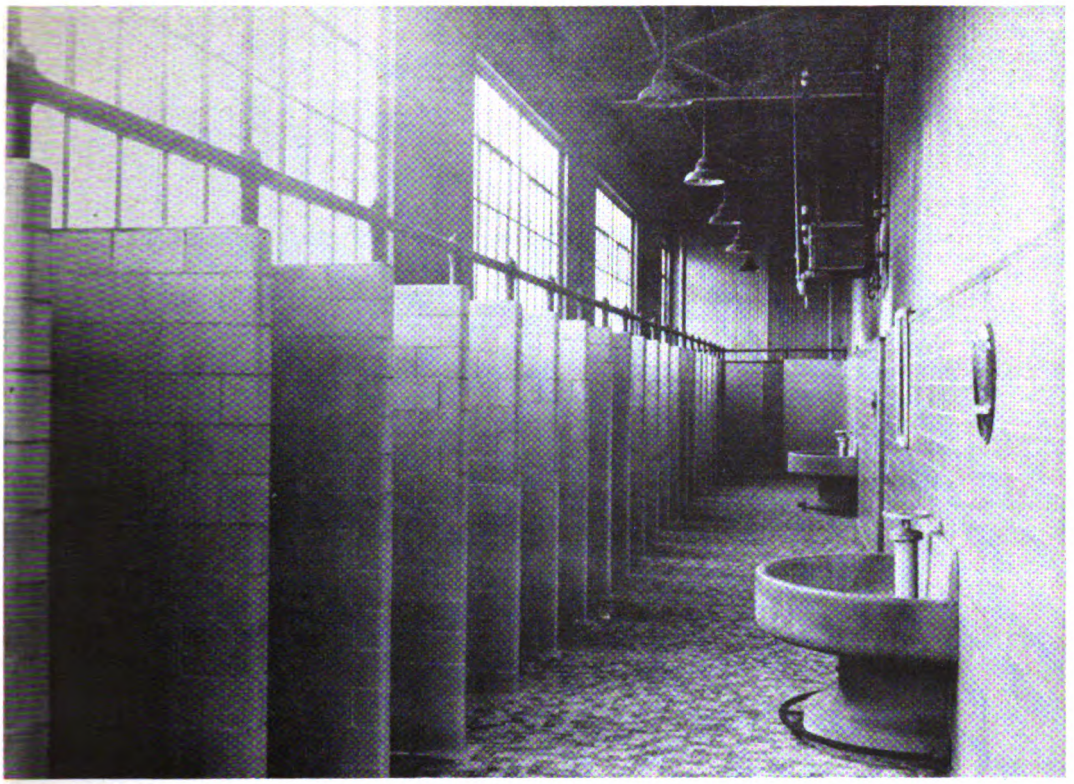

Figure 17. - Semicircular wash fountains.

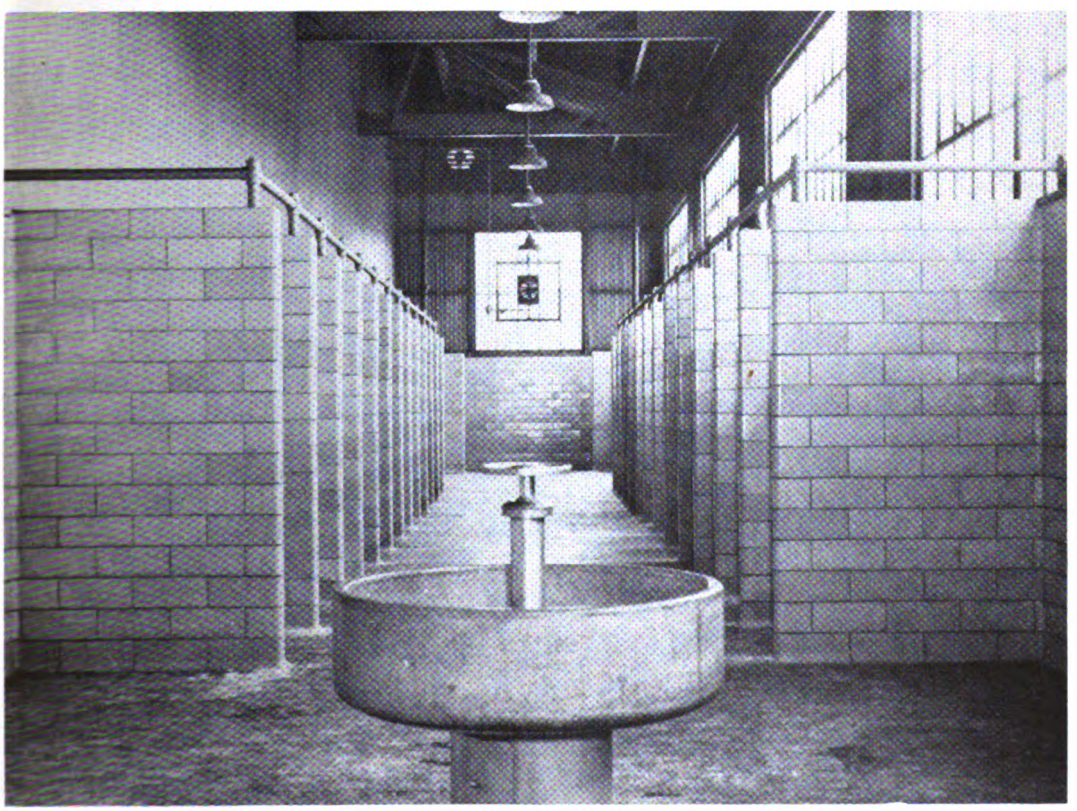

Figure 18. - Circular wash fountain.

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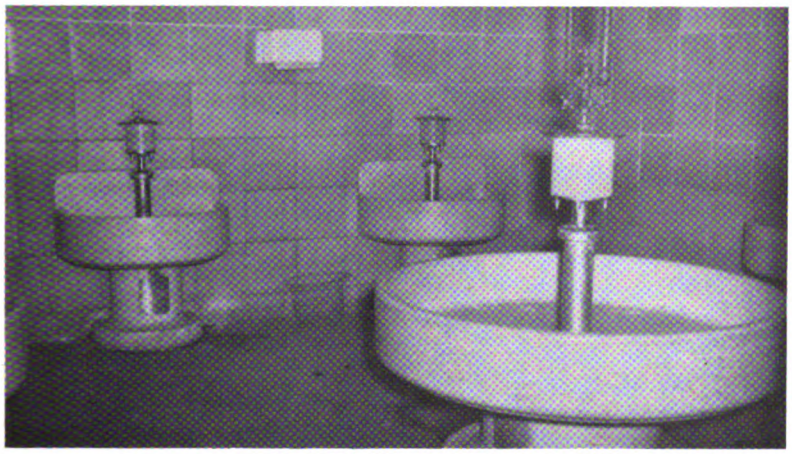

Figure 19. - Semicircular and circular wash fountains.

Figure 22. - Toilet facilities.

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Figure 20. - Toilet installation.

Figure 21. - Urinal.

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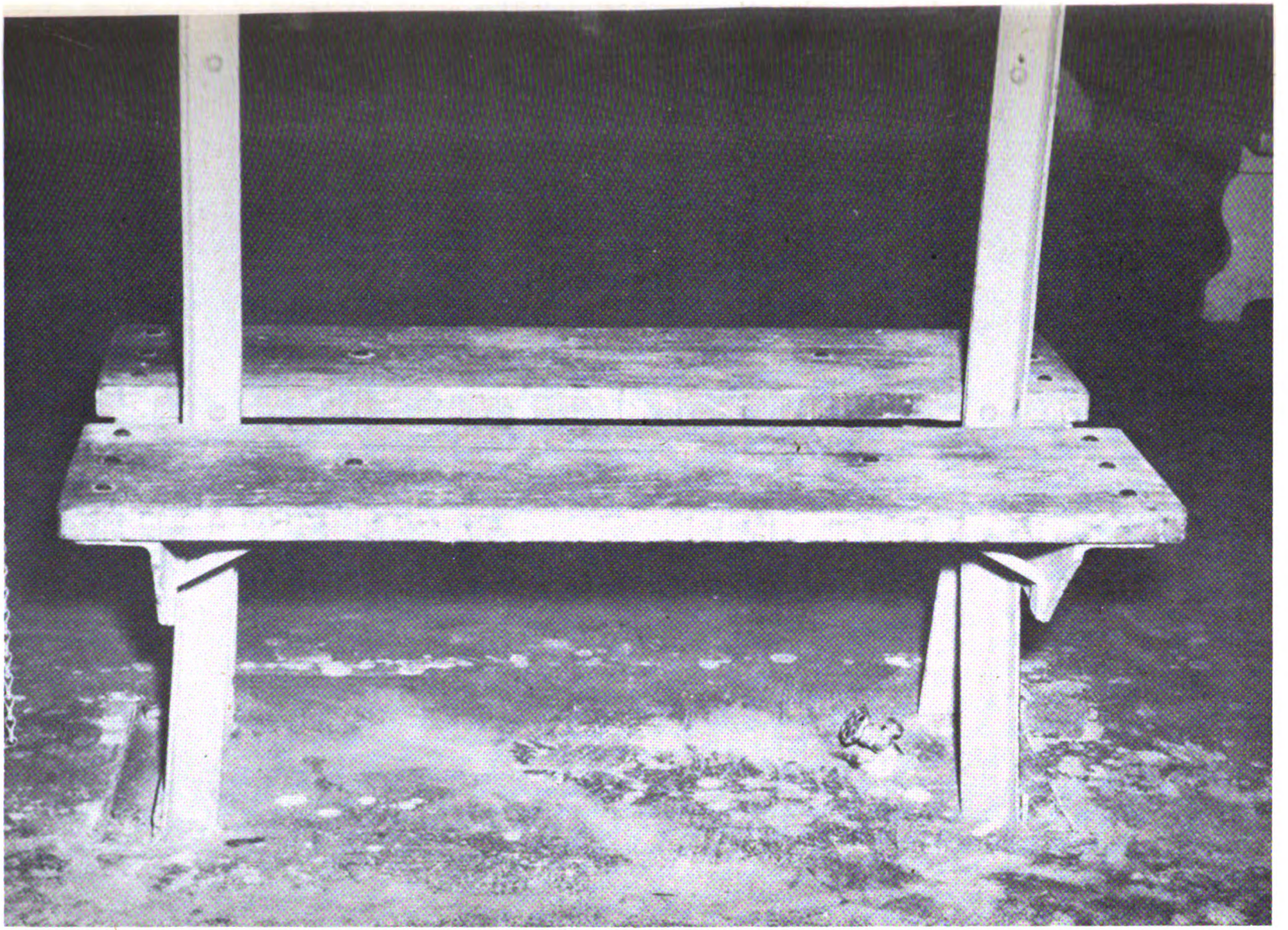

Figure 23. - Bench in a change room. Note the connection for water hose under the bench.

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1 toilet for every 100 men on shift, but it is more common to provide 1 toilet for every 50 men employed on a single shift. Figures 16, 20, 21, and 22 illustrate examples of modern installations.

Wash Tubs

Some wash and change houses are equipped with set tubs for washing work clothes. The tubs are the usual type of laundry tub found in residential buildings. Mine officials encourage the miners to use this equipment to wash their work clothes on idle days or after the working shift. Many mines in the Lake Superior mining district provide hand-operated or electric washing machines.

Drinking Fountains

Sanitary drinking fountains should be provided in every wash and change house. There are many types available, but the fountain type should be selected that prevents a person's mouth from coming in contact with the water outlet.

The use of individual paper water cups and refrigerated water also is in more or less common use. Some mines provide bottled water for the employees in regions where the normal water supply is contaminated or unpalatable.

Benches

Benches should be provided in wash and change houses for the convenience of employees when dressing or undressing (fig. 23). It is customary to attach the benches to the floor so that they cannot be shifted about. Usually, the benches are made with pipe or structural steel legs and a smooth-painted or varnished top of wood. The dimensions vary but generally range in length between 5 and 10 feet.

Wash and Change House Attendant

Each wash and change house, when used for other than just a few men, should have an attendant whose duties include keeping the floors and walls clean, regulating the temperature of the rooms when not controlled by a thermostat, providing sufficient hot water for baths, keeping unauthorized persons from entering the building, and other miscellaneous duties. This man should be able to perform fairly arduous duties rather than being merely a pensioner.

Fire-Fighting Equipment

Adequate fire-fighting equipment should be provided at all wash and change houses. This equipment should include properly placed fire extinguishers, pails of dry sand, and, if water lines are available, fire hose long enough to reach to all parts of the building. Fire hydrants should be placed so that they are always accessible in case of fire.

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Some companies have installed sprinkler systems in the locker rooms of wash and change houses as an additional precautionary measure. Other companies have installed fusible links in the lines that raise the clothing to the ceiling. If the temperature rises as in case of fire the fusible link parts the line and the clothing falls to the floor.

Hot Water for Shower Baths

The hot water for shower baths is usually obtained by heating a water supply to a predetermined temperature with live steam. The steam in some instances is provided by a small boiler plant built for the purpose at or near the wash and change house; other mines provide steam from the main boilers used for power purposes.

The temperature of the hot water for the baths should be low enough to preclude the possibility of scalding the body if the user inadvertently turns the hot-water valve in the wrong direction, or if the cold-water supply is suddenly stopped.

The hot and cold water at the shower baths is generally controlled fairly accurately by means of a mixing valve, or at the shower head. The possible admission of extremely hot water in case of cold-water-supply failure can be controlled by supplying the cold water from a tank rather than direct from the water-supply mains. The former practice of heating water for showers by admitting live steam at or near the shower head is regarded as dangerous.

Pipes leading to shower heads should be sufficiently large so that there will be no marked change in temperature of the bath water when an adjoining shower is turned on.

The quantity of water required per man per shower bath varies greatly in different districts. Large wash and change houses with facilities for a large number of baths usually plan to supply 40 gallons of water per man per bath. The quantity supplied varies and depends on the availability of hot water, number of baths taken at one time, and similar conditions.

Miscellaneous

Many mining companies have the lamp house, time office, and identification-check board placed in or adjacent to the wash and change houses to make them more convenient for the employees. Other mining companies pay their employees their regular pay days.

Separate facilities of the same type as the rest of the equipment in their wash and change house are frequently provided for the foremen and supervisory personnel. It is not unusual for the office of the foremen to be located in the wash and change house where it is convenient for the employees.

Installations of loud-speaking devices in wash and change houses are fairly common at mines. A microphone is placed in the foreman's office and used in making official announcements and giving instructions; a second

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microphone is usually installed elsewhere in the building for the benefit of employees who wish to make unofficial announcement of various activities. Such installations are inexpensive and are a convenient means of supplementing bulletin boards.

Safety poster bulletin boards are frequently placed in a prominent place in a wash and change house where the employees must pass in going to and from work. Many mining companies favor this location of the bulletin board because virtually all of the employees have the opportunity to see the safety posters. Some coal-mining companies also post the daily weights of coal credited to each loader on the same or another bulletin board placed nearby.

Mines that have connecting passageways between the mine entrance and the wash and change house often have heated waiting rooms at or near the entrance where the miners congregate while waiting for the cage or man-trip; generally, the room is provided with safety bulletins and sometimes a radio. Motion pictures of general interest are shown in change houses at some mines.

First-aid rooms are in or adjacent to many wash and change houses, especially those built in recent years; it is convenient for the men as well as being easy to provide hot and cold water as needed. At some mines the attendants are trained to administer first aid to the injured employees under the supervision or direction of the doctor.

SEWAGE DISPOSAL

Provision should be made for the disposal of the drain water and sewage promptly and completely. Some larger mines have sewer systems which are utilized in connection with the wash and change houses, but by far the larger number of mines are remote from any type of sewage-disposal system and must provide their own facilities.

Cesspools and septic tanks are commonly used for sewage disposal, and the drain water is piped away and allowed to waste on unoccupied land; in other cases the drain water is utilized to help flush the sewage into rivers or streams. This practice is generally condemned if the river water is used as a water supply farther down stream. If the soil overlies a sand or gravel bed which will readily carry away the liquids without contaminating the water in nearby water wells, it affords a cheap and easy solution to the problem. Septic tanks, properly designed and constructed, are satisfactory for sewage disposal.

Septic Tanks

Septic tanks to dispose of wastes of human origin are in more or less common use at mines that do not have the advantage of sewers or other types of sewage-disposal systems. They are hygienic if the tanks are constructed properly and placed in accordance with approved specifications.

A septic tank is simply a nonleaching (watertight) cesspool provided with an overflow; it is not a complicated or costly structure, as is often believed. The purpose of the septic tank is to separate and settle from the

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liquid as much as possible of the solid material in the excreta and to destroy the solid material by bacterial agencies. The theory of operation is that the solid matter is attacked by bacteria which change most of it into compounds, part liquid and part gaseous.

The details and specifications of various septic tanks are shown in publications of the United States Public Health Service; these publications include "Rural Sewage Disposal Recommendations of Joint Committee on Rural Sanitation," Reprint No. 2461, and "Sewage Disposal for Suburban and Country Homes," Supplement No. 58 to the Public Health Reports.

Open Privies

The privy-type toilet should never be considered a permanent installation; it is one of the most common causes of infection and disease. Contamination of the water supply by this type of toilet in many instances has been determined definitely as the source of typhoid-fever epidemics.

If circumstances require the use of an open-type privy even for a short time, every effort should be made to keep it sanitary and flyproof. All openings should be screened and the cracks covered with battens; the bottom of the house should be banked with dirt; and the excreta should be well-covered with oil or lime. Each seat should be provided with a cover arranged to drop automatically and the doors should be closed with a spring or other automatic device. The pit should never be less than 5 feet deep, and when it is half-filled, a new pit should be dug and the building moved to it. The old pit should first be burned out and then filled with dirt.

ATHLETE'S FOOT INFECTION

A ring-worm infection of the feet, commonly called "athlete's foot," is more or less prevalent among miners, particularly those whose feet are damp or wet. It is a fungus infection and is caused at least partly by excessive perspiration of the feet or improperly cleaned shower baths and floors. Athlete's foot is supposed to be transmitted by walking barefoot on surfaces that are infected, such as floors, but it is also transmitted from contaminated clothing, slippers, shoes, and towels.

Athlete's foot is not a new disease, since its occurrence can be traced back to the Middle Ages. It often starts with soft, soggy skin, frequently white, between the toes and deep cracks usually develop between and under the toes. Sometimes small water blisters appear around the toes and they itch badly. If not checked, the infection may cover the entire foot and often results in complete disability. Athlete's foot should be treated by a physician.

In many instances, the fear of becoming infected with athlete's foot is responsible for employee opposing wash and change houses provided for them.

Much has been written for and against remedial measures that may be used in shower baths and in change rooms where men walk in their bare feet.

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It is not the purpose of this publication to advocate any method of preventing or controlling the spread of athlete's foot infection, since a method that can be termed a true specific has not been developed, so far as is known. Various methods that have been used or are now used are discussed briefly.

Some wash and change houses have foot baths containing a solution of sodium hyposulfite at the exit from the shower rooms. The miner, on completion of his shower bath, steps in the foot bath and goes directly to the locker room. Some mines have the foot bath at the exit so that the miner must step into the disinfectant solution to reach the locker room; other mines place the foot bath on one side of the exit so as to make the disinfectant easily accessible to the miner, but its use is voluntary. A wide divergence of opinion exists as to the effectiveness of this type of foot bath.

In South Africa it is reported that doctors studying the incidence of athlete's foot among miners using wash and change houses observed that, when water from the mines was used in the shower baths, athlete's foot was practically nonexistent. The water was found to contain a very small amount of copper. The same doctors observed that, when the source of water for the shower baths was from the river which contained no copper, athlete's foot was prevalent.

A recent development in methods or ways of preventing athlete's foot infection is reported to be a cement surfacing material containing cupric oxychloride; the material is a magnesium oxychloride cement containing finely divided copper. The magnesium oxychloride combines with the copper to form cupric oxychloride. When wet, the material releases a minute amount of the copper compound, which is said to destroy bacteria and fungus. It is claimed that floors surfaced with this compound are effective in preventing athlete's foot infection. It is reported that a flooring of this material was placed in a bakery to kill mold and bacteria, and in a few days numerous cockroaches that infested the place were gone. It may be effective in controlling vermin.

DESCRIPTIONS OF WASH AND CHANGE HOUSES

Descriptions of modern wash and change houses now in operation may be helpful to those who are planning to make such installations for the first time, or are planning to modernize existing ones.

Wash and change houses designed for the use of a large number of employees often are better equipped than when only a few persons are to be served. Descriptions of large, medium, and small wash and change houses are given below. These wash and change houses are selected as being good examples of such installations, even though in some particulars they may not include features that are considered desirable.

Wash and Change House - Capacity, 1,020 Men

Building Construction

The building is 51 feet 6 inches by 190 feet, the change room and locker space 40 by 190 feet, and the showers, toilets, and service facilities 11

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feet 6 inches by 190 feet. The outer walls are of concrete-block construction. A basement under the shower and toilet portion of the building accommodates water heating equipment and plumbing. No ceiling is used as the roofing sheets form the ceiling. A partition separates the locker room from the shower room. The height from the floor to the truss line in the main locker room is 16 feet. The floor in the locker room is concrete; the shower room and toilet have a concrete floor with ceramic tile part way up the sides. The sloping, peaked roof has a steel framework and is covered with galvanized, corrugated roofing sheets. The roof is insulated.

Lockers

The lockers are of the overhead type and consist of 10 units of 102 lockers each, a total of 1,020 lockers. The steel lockers are suspended by hangers from the roof trusses. The lockers are 21 inches square by 2 feet 11 inches high, and the bottom of the lockers are 10 feet above the floor.

Each locker has a clothes hanger; the steel clothes hanger is equipped with a circular metal pan to receive such articles as shoes, boots, hat, etc. The hanger is suspended by a light metal chain which passes over a series of small pulleys; the chain extends to central points where it can be reached to raise or lower the clothes hanger. The movement of the chain is limited to prevent the hanger from passing a predetermined point above the floor. The chains are locked in the elevated position with locks furnished by the employee. A fusible link is used between the clothes hanger and the supporting chain to cause the hanger to fall in case the clothing catches fire, thus avoiding the spread of fire to adjacent lockers.

Bathing and Toilet Facilities

The bathing and toilet facilities consist of the following:

46 showers
Four 54-inch semicircular fountain washbasins
8 toilet stools
8 urinals
1 slop sink
2 hot-water heating and storage tanks

The hot-water heating and storage tanks are 60 inches in diameter and 192 inches long. Each has a storage capacity of 2,300 gallons. The bathing water is heated to 160° F. by steam coils. The water is delivered to the shower heads at 130° F. to avoid scalding; the thermostat-controlled valve regulates the temperature of the water delivered to the shower heads. The flush valve is designed to cut-off automatically at a perdetermined set time interval in order to conserve water if the shower is left running. Ordinarily, the bathing period extends over about 30 minutes, and one shower stall is provided for every 8 to 10 men bathing during the period.

Heating

Eight overhead-unit-type heaters are used for heating the building. The heaters are controlled in groups by three thermostats, at various places in the building to maintain the desired temperature.

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Ventilation

Ventilation is induced by eight fans; four fans are placed in dormers in the roof and four in the end walls. Fresh air enters the locker room through openings in the floor under the benches. These openings are closed during the cold season.

Wash and Change House - Capacity, 810 Men

Building Construction

The building is 44 feet 10 inches by 168 feet 10 inches, the change and locker space occupying 32 by 168 feet, with shower, toilet, and service facilities occupying a floor space of 12 by 136 feet. A basement room, 28 by 44 feet, is provided for water tank storage and heating. Enough space is allowed below floors for all service facilities, piping, wiring, etc., throughout the building. A partition separates the locker rooms from the shower rooms. Interior walls are of metal lathe and plaster with ceramic tile up to 6 feet 6 inches above the floor in the shower and toilet services. The ceiling height in the change and locker rooms is 17 feet 5 inches above the floor. Foundations throughout the building are of reinforced concrete with concrete floors in the locker rooms and ceramic tile floors in the showers. The building is of fireproof construction throughout utilizing steel and concrete material and has a sloping peaked roof.

Lockers

Lockers are of the overhead type, consisting of 9 units of 90 lockers to the unit, making a total of 810 lockers. The lockers are constructed of steel and supported on hangers fastened to a beam, which spans the full width of the building and is provided especially for this purpose. Each locker compartment is 21 inches square by 2 feet 11 inches high and open at the top and bottom. The bottom of the locker is 9 feet 6 inches above the floor.

Each locker has a clothes hanger, equipped with a circular metal pan at the top to receive articles, shoes, hat, etc. The hanger is suspended by a light metal chain over a series of pulleys. The chain extends to connections at central points between groups of lockers where it can be reached by the user for raising and lowering the clothes hangers. The end of the chain is fastened to limit the low position of the clothes hanger at a convenient position just above the floor. The users furnish their own locks for fastening the chain with hangers in the raised position within the locker cell.

A fusible link is used between the clothes hanger and the supporting chain to cause the hanger to fall if the clothing catches fire, thus avoiding the spread of fire to adjacent lockers.

Twenty dressing benches are provided for the convenience of the men in changing clothing. Each bench is 8 feet long, with a rack that extends its full length and forms a back on which are mounted clothes hooks for hanging clothes temporarily while making clothing changes.

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Space Heating

The change and locker rooms are heated by five blower-type-unit heaters mounted overhead. The shower rooms and foreman's room are heated by seven floor-type standard steam radiators. Heat is controlled and maintained at the desired temperature by thermostatic controls.

Ventilation

Ventilation is provided by four large-capacity exhaust fans. Two are located above the ceiling in the change and locker rooms. Twenty-seven openings in the ceiling are directly connected to the exhaust fans by metal air ducts. The shower and foreman's rooms are each ventilated by the same method, with an exhaust fan located in each end of the building and connected by metal air ducts to ceiling outlets.

Steam

Steam for heating the building and the water is furnished by the main boiler of the mine installation.

Foreman's Locker and Toilet Facilities

The building includes a room 12 by 32 feet equipped with 4 shower stalls, toilet services, and 32 lockers. The construction is identical to that used in the other locker and shower rooms. Interior partitions separate the foreman's locker room and showers from the remainder of the building.

Bathing and Toilet Facilities

The bathing and toilet facilities consist of:

59 individual shower stalls
Three 54-inch semicircular wash basins
7 toilet stools
6 urinals
1 waste stand
2 hot water heating and storage tanks.

The two hot-water heating and storage tanks are 84 inches in diameter by 168 inches long, and each has a storage capacity of 4,031 gallons. Water is heated to 160° F. by steam coils. The hot water is delivered to the showers at a maximum temperature of 130° F. to avoid scalding. The 130° F. temperature is obtained by an automatic water-temperature control valve on the hot-water circulating pump.

Each shower stall is equipped with two ½-inch mixing valves, which are manually operated to obtain the desired tempered mixture of hot and cold water. The bathing period normally extends for 45 minutes, providing one shower stall for 16 to 18 men during that period.

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Wash and Change House - Capacity, 287 Men

Building Construction

The building is of concrete and brick construction with outside over-all dimensions of 50 feet 8 inches by 143 feet 8 inches; it has two stories for 82 feet of its length and one story for the remaining part. The second story is used as a garage and warehouse. The ceiling height of the wash and change house, which occupies the entire lower floor, is 13 feet. All partitions are of hollow tile, and all interior walls are plastered; interior doors are steel and exit doors are wood.

Locker Rooms

The wash and change house is divided into two halves - one side is termed the "clean side" or "street side", and the other is the "mine side" or "dirty clothes" side.

The street side consists of a vestibule, "dry man's" supply room, combined wash room and toilet room, large clean clothes locker room, foreman's locker room, and office. The time clocks and bulletin board are in the vestibule. The dry man's supply room contains supplies for the wash and change house, and is used as a timekeeper's office and a pay office. The combined wash room and toilet room is equipped with two spray-type wash troughs, four toilets, and a urinal.

The large locker room has 287 lockers that are used only for clean clothing. All the lockers are set permanently in the concrete floor and have wooden benches attached. The foremen's room has 24 lockers; this room is used daily as a meeting place for all department heads.

The "mine side" of the wash and change house consists of a large dirty clothes room, shower room, toilets, laundry, electric lamp room, and a small dirty clothes room used by the foremen. The large dirty clothes room is 24 by 77 feet.

The underground clothes are exposed to drying and aeration by being suspended from near the ceiling on specially designed hooks. The room contains 262 hooks; 1 hook is assigned to each man. The hooks are designed so that clothes, when properly hung, will dry thoroughly; the hooks are attached to an endless chain which passes over a pully suspended from the ceiling. The chains are equipped with rings which permit the locking of the chain after the hooks are pulled up. Each man is supplied with two combination-type padlocks having the same combination, one for the clean clothes locker and one for the dirty clothes hook. Each hook has a small wire basket attached that is suitable for holding incidentals that the miners prefer to remove from their clothes. A stationary bench constructed of steel and having a wooden plank top is placed beside each row of hooks.

Shower Room

The shower room is 19 by 23 feet with a wainscoting of glazed brick on the walls 9 feet high and adjoins the dirty clothes room. The shower room

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contains 33 shower heads, each equipped with mixing valves. All hot water supplying the showers passes through a controlled mixing valve, thus eliminating the hazard of scalding. A 2-inch pipe railing parallels the walls of the room about 1 foot above the floor and 1 foot out from the wall to facilitate washing the feet. Liquid soap dispensers are distributed throughout the room; the liquid soap is piped from a mixing and storage tank in the garage above the shower room. The exit from the shower room leads into a hallway connecting the vestibule and the street side locker room.

The small dirty clothes room for foremen is similar in design to the large room and contains 18 hooks. A small shower room containing 2 shower heads is between the foremen's clean clothes locker room and the dirty clothes lockers, and is finished in glazed brick in the same manner as the large shower room.

Concrete Floors

The concrete floors are unpainted. Wet concrete floors present a slipping hazard. This has been minimized by the introduction of ground corundum into the concrete just as the final troweling was being done.

Heating and Ventilation

The street side locker room is heated by unit heaters, with one unit connected to the outside by a duct that permits the introduction of fresh air whenever needed. The dampers in this duct are controlled manually and can be set to introduce only fresh air, to recirculate the air, or any combination of the two. All unit heaters are controlled with thermostats. Air is exhausted from the street side locker room through roof ventilators equipped with manually controlled dampers.

The mine side of the wash and change house is heated and ventilated by a central unit located in the warehouse on the second floor of the building. This unit has a capacity of 9,000 c.f.m., of which 8,000 c.f.m. goes to the large dirty clothes room and the remainder goes to the small dirty clothes room and other outlets. Air is changed completely every 3 minutes.

The air is introduced into the rooms from an interior duct that extends the full length along the outside wall. It is 36 by 30 inches in cross section at the fan, diminishing to 24 by 12 inches at the far end of the dirty clothes room and to 20 by 12 inches at the end in the small dirty clothes room. There are twenty-eight 12- by 8-inch grilles spaced at regular intervals in the duct in the large room; three are in the small room, and one each in the laundry room and lamp room. The duct is fitted with dampers at each grille to control the air distribution through the rooms. The air coming from the grilles moves across the room above the clothes to the opposite wall; then it is deflected back and downward through the clothes.

The return air from the two dirty clothes rooms is handled in concrete ducts beneath the floor. Two ducts with fourteen 14- by 10-inch openings extend the length of the large "dirty clothes" room and join a single duct from the small room. From this junction, a single duct extends across the

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building to a point between the large locker room and the wash room on the "street side." The air from the ducts goes to a ventilating unit and passes through a filter bank and is then recirculated. The floor openings to the ducts are provided with drains that permit periodical washing away of dust accumulations. Air is exhausted from the shower room, laundry room, and lamp room through roof ventilators.

It should be noted that warm air is introducted at ceiling elevation and removed at the floor. This is done for two reasons: First, to gain any possible settling advantage resulting from the high specific gravity of the hematite dust; and second, to move the dusty air down and away from the faces of the men dressing.

Ventilation and Heating Controls

The ventilating and heating units consist of:

1. A fresh-air and recirculated-air mixing chamber controlled by interconnected dampers on both openings.
2. A filter section.
3. A face and bypass damper section controlling the air passing through the heating coils.
4. A heating coil section.
5. An inlet vane control section that controls the amount of air supplied.
6. A fan section.

All dampers in this unit, as well as the dampers in the two roof ventilators from the large dirty clothes room, are electrically operated and automatically controlled. It is possible to control the entire system manually and, by so doing, to rapidly cool the rooms for the comfort of the men changing their clothes. A temperature of 85° F. to 100° F. is maintained for drying, depending upon the relative humidity of the outside air.

The dry bulb temperature of the "mine side" is controlled by a dry-bulb thermostat in the recirculated air duct. To prevent unduly chilled air from entering the room, a low-temperature control thermostat is located in the discharge duct and functions to prevent the discharge air from going below a predetermined setting.

Humidity Control

The humidity of the room, so important in drying clothes, is controlled by a wet-bulb thermostat located in the recirculated air duct close to the dry-bulb thermostat. Its action is such that, with an increase of humidity in the recirculated air, the fresh-air damper opens to admit more fresh air and dilute the moist air to a satisfactory humidity. The wet-bulb thermostat

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also controls two damper motors in the two roof ventilators from the dirty clothes room; their action is synchronized so that, as more fresh air is admitted, the roof ventilators are opened wider, permitting exhausting of the damp air.

This mine wash and change house is in a region where extremely cold weather in winter is common, and it is important to provide adequate control of the temperature and humidity to dry the mine clothes properly and to prevent drafts where the men change clothes.

Tunnel Connects Wash and Change House With Shaft

The wash and change house is connected to the mine shaft by a concrete tunnel 70 feet in length; the tunnel has two entrances, one directly opposite the lamp room and the other leading from the foremen's dirty clothes room. The concrete tunnel extends a few feet into the wash and change house; here four short lengths of hose are provided for use by the miners in washing their boots. A permanent bench along one side of the tunnel provides a place for the men to sit down while waiting to go on shift.

As the miners enter the wash and change house upon coming to work, they punch the time clock in the vestibule, then pass through double doors into a short hallway and into the street side locker room where they remove their street clothes. They then enter the large dirty clothes locker room on the mine side through a one-way door. After dressing in their underground clothes, the men walk down a hallway past the shower and toilet rooms, stop at the lamp room for their lamps, and pass through the concrete tunnel to the shaft. After the men have changed to their underground clothes they are not permitted to return to the clean clothes side. As the miners come off shift they take a shower bath before entering the clean side of the wash and change house.

Wash and Change House - Capacity, 500 Men, Working In Two Equal Shifts

The wash and change house building consists of a change room, a shower room, a lamp room, and a foreman's office. This arrangement permits the miners to change their street clothes for underground clothes on coming to work, report to the foreman, receive their identification checks, secure their electric cap lamps in the same building, and have the convenience of the bath house at the end of the shift. The wash and change house has a capacity for 500 men when they are equally divided on two shifts.

Building Construction

The over-all dimensions of the building are 127 feet 8 inches by 44 fee the change room is 91 by 35 feet and the shower room is 91 by 9 feet. The foundation and floor are concrete; the walls are tile and brick 8 inches in thickness; and the ceiling is metal lath and plaster. The interior tile and brick walls have a glazed smooth finish to aid in keeping them clean.

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Change Room

The change room is provided with 10 double benches. Metal baskets attached to chains, which pass over pulleys in the ceiling, are provided for the miners'clothes. The baskets are raised to the ceiling, and means are provided for locking the chains when the baskets are in the raised position; the baskets are directly above the benches and are spaced so as to be convenient for the miners. The change room has two exits.

Shower Room

The brick and tile shower room which extends along one side of the wash and change house has 10 entrances from the change room; this is equivalent to an entrance for each double bench. The shower room is provided with 55 water sprays spaced evenly along 2 sides of the room. The concrete floor slopes to a drain trough along the outside wall. The temperature of the bath water is controlled by a thermostat mixing valve. The hot and cold water are mixed in such proportions that the resulting temperature of the water ranges from 86° to 90° F. The water sprays are operated by hand valves, but the bather does not control the temperature of the water.

A tray containing a disinfectant foot bath is placed at each entrance to the shower room; the disinfectant solution is changed daily.

Heating and Ventilation

The wash and change house is heated by steam. The radiators in the change room are hung on the walls, and those in the shower room are suspended from the ceiling. All radiators and steam pipes are at least 6½ feet above the floor to avoid personal contact with them.

Three roof ventilators with grilles in the ceiling are installed in the change room, and three are installed in the roof and ceiling of the shower room.

Lighting

The wash and change house is well-illuminated. Light is admitted to the change room through 27 fixed and transom-type windows and to the shower room by 10 insulox glass block windows.

The electric wiring conforms to the requirements of the Underwriter's Laboratories, Inc.; the lights are on a 110-volt circuit. All wiring and switches are enclosed. The switches are installed in the change room at the entrance, but no switches are installed in the shower room. The light globes are covered with a clear glass shield which is heat-resistant, and the glass shield is protected by a metal shield. The shower room is illuminated by a row of 10 lights that are installed near the inside wall at the ceiling. The change room is illuminated by a row of 10 lights along the inside wall near the ceiling and a second row of 10 lights similarly placed along the outer wall.

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Boiler Room

The boiler room is in the basement of the building. An automatic stoker feeds coal from a bin to a low-pressure steam boiler; an ash lift is provided to remove the ashes from the boiler room to the ground level. The boiler is operated at a maximum of 5 pounds steam pressure. An indirect water heater is used to heat the bath water to a maximum temperature of 400° F. Two steel hot-water tanks, 48 by 156 inches, with a capacity of 1,300 gallons each, are used to store the hot water for the brief heavy-demand period after each work shift. The water is circulated to the shower heads through a pipe by an electrically operated pump, so that each shower head is provided with an adequate supply of water near the predetermined temperature.

Wash and Change House - Capacity, 50 Men

A wash and change house designed to furnish facilities for 50 men, all on 1 shift, is briefly described.

Building Construction

The outside dimensions of the building are 20 by 40 feet, with the ceiling 15 feet high. The walls are constructed of concrete blocks and the gable roof is wood, with asbestos shingles. The floor of the entire building is concrete. The inner walls are constructed of metal lath and plaster, and all inside walls are lined with glazed tile to a height of 7 feet above the floor.

Shower Room

The shower room is 8 by 24 feet, with two doors connecting with the change room.

The shower room contains six shower heads placed in stalls along the outer wall of the room. Hand-regulated mixing valves control the temperature and the quantity of the bathing water. Each stall has a drain covered with a perforated plate to carry away the waste water, and a soap receptacle is attached to the outside wall near the regulating valves.

The temperature of the hot water supplied to the shower heads is regulated automatically at the water storage tank. Thermostats prevent the storage-tank water from being overheated.

Locker Room

The locker room is approximately 12 by 40 feet and contains 50 open-mesh-type steel lockers for street clothes and 50 hook combinations attached to chains to elevate the working clothes to the ceiling.

The steel lockers are raised about 6 inches above the floor on legs that are set in concrete. The lockers are locked with a combination lock furnished by the company.

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The working clothes are placed on hooks attached to a chain and elevated to the ceiling. A fusible link is placed in the chain where it will be near the ceiling when the clothes are in the raised position. If the clothes should start to burn, the fusible link parts and the clothes fall to the floor. This helps to prevent the fire from spreading. The movement of the chain is stopped approximately 4½ feet above the floor. Rings are placed in the chain so that the chain can be locked when the clothes are in the raised position. A wire basket is attached to the chain to take care of the miner's boots, hard hat, or other items. The chains are locked with a combination lock having the same combination as the lock on the street clothes locker.

Benches are placed on the floor in front of the steel lockers for the miner's convenience while changing clothes. The benches consist of a smooth wooden plan 12 inches wide supported on angle-iron supports spaced at 5-foot intervals. The steel supports are attached to the concrete floor and cannot be moved.

Concrete Floors

The concrete floors are unpainted. The floor in the change room slopes to three drains spaced evenly along the center of the room. The floor in the shower room slopes to the shower stalls. The floor of the entire change house can be washed with a hose.

Heating and Ventilation

The wash and change house is heated with steam from the main boiler plant. The steam pipes are placed along the walls about 7 feet above the floor level. Air ducts covered by grilles are placed at the floor level, and ventilation is induced by an exhausting fan which removes the air at the floor level.

The shower room is ventilated with adjustable ventilators in the roof which allow the hot, humid air to escape to the atmosphere.

Lavatory and Washing Facilities

A semicircular wash fountain is placed at each end of the shower room. An adjacent room containing two toilets and a trough-type urinal are in the lavatory. The room is ventilated with a small wall-type exhaust fan.

Drinking Water

A sanitary drinking fountain is at each end of the change room. A metal guard prevents contact of the mouth with the water outlet.

Hot Water Storage

A 550-gallon water tank placed in the basement of the wash and change house provides abundant hot water storage for the shower baths. The water is heated with live steam to a predetermined temperature from the main boiler plant.

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Foreman's Office

The foreman's office is located at the end of the building adjacent to the shower baths. Lockers for the supervisors are in the office but no shower baths or washing facilities.

Wash- and Change-House Data

Men accommodated, number..	538	430	96
Building construction			
outside walls	steel frames, concrete blocks	steel frames, concrete blocks	brick
inside walls	concrete blocks	concrete blocks	brick
roof	tar and gravel on gypsum tile	gypsum tile with 4-ply roofing	asphalt shingle
floor	cement	cement	cement
Dimensions of building			
width	36'	44'	24'
length	139'4"	100'	48'
ceiling	16'3¼"	16'9"	16'
Men accommodated per shift			
day	419	320	70
night	119	110	26
Shower baths			
number	36	30	8
type	Industrial	Industrial	Industrial
Foot baths, number	2	2	2
Toilets, number	14	6	2
Urinals			
number	1	2	2
type	trough	trough	trough
Wash basins, number	5	4	3
Drinking water	1 fountain	none	none
Benches, number	32	21	12
Lockers			
number	462	440	0
type	steel	steel	-
Ceiling hook, combinations.	538	440	89
Lighting, voltage, direct current lamps	250	250	250
300 watt	2	2	0
200 watt	32	20	6
Heating, method	steam	hot water	hot water
Ventilation			
method used	natural	natural	natural
No. ventilators	5 roof	5 roof	2
diameter of ventilators	20"	24"	30"
Sewage disposal	piped to creek	piped to creek	piped to creek
Cleaning			
how	swept and hosed	swept and mopped	swept and hosed
how often	daily	after each shift	daily
Caretakers, number	2	3	3

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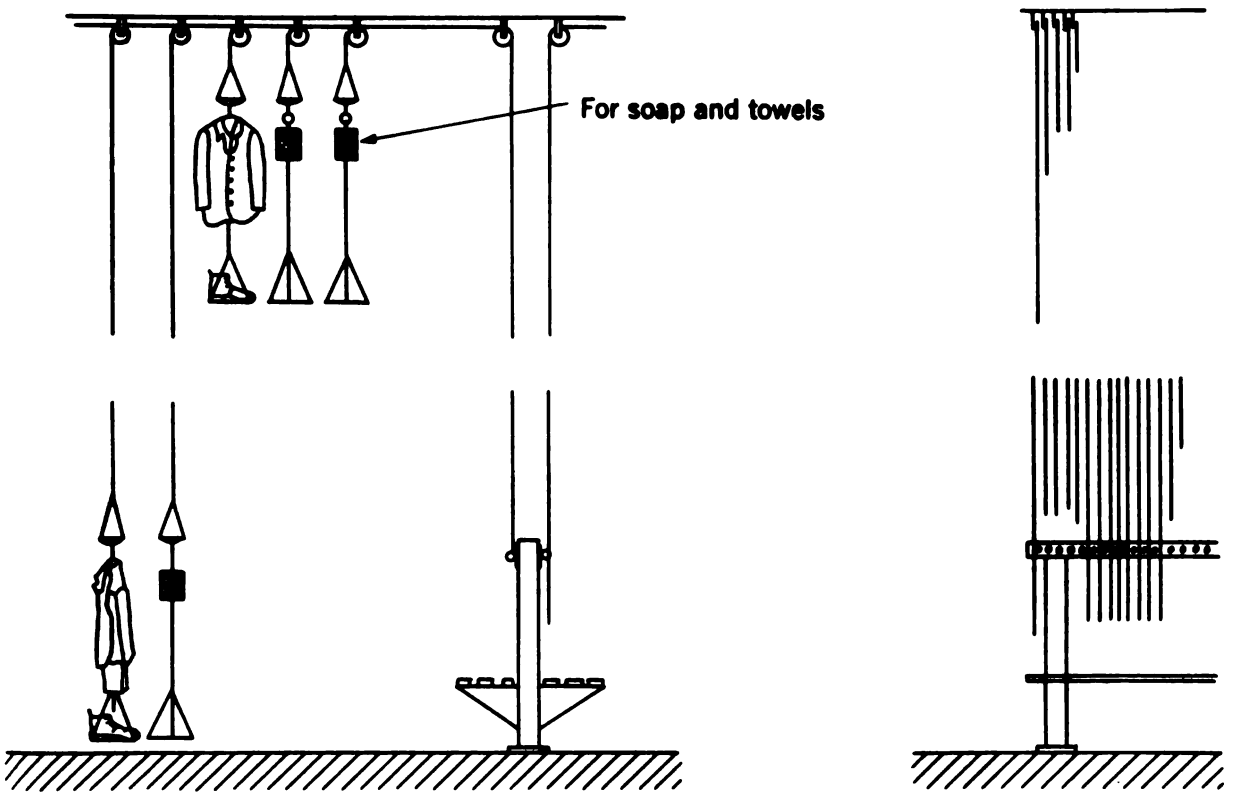

Figure 24. - Sketch showing method of using clothes hangers in a German wash and change house.

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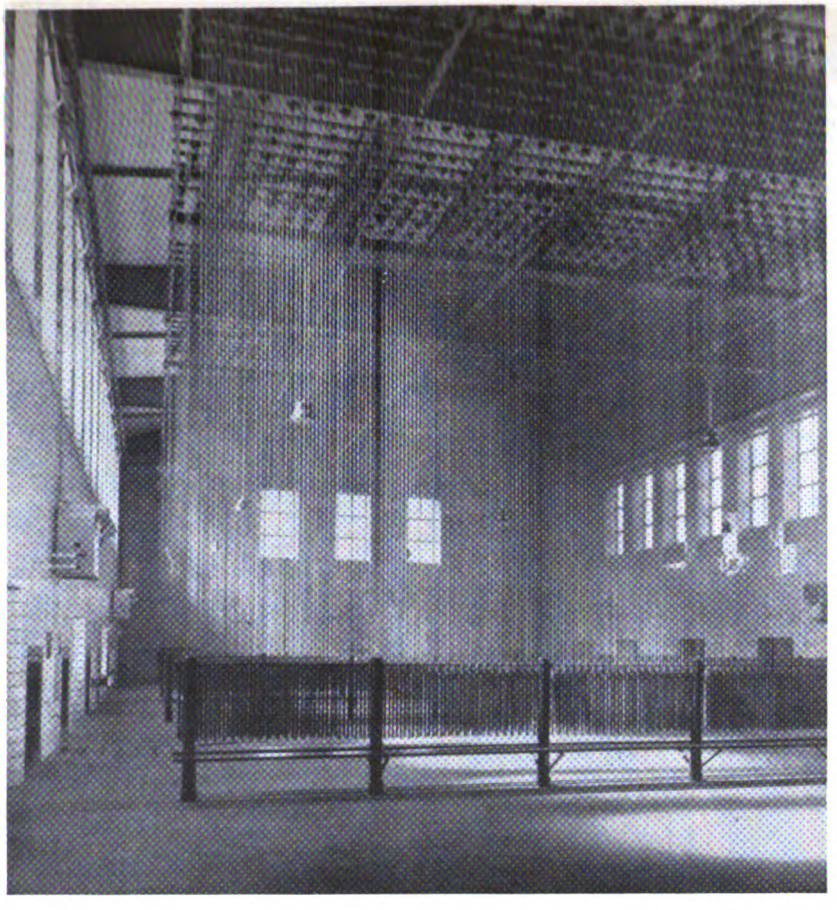

Figure 25. - Locker room of a wash house at a large German coal mine. The warm air distributors are on the side walls.

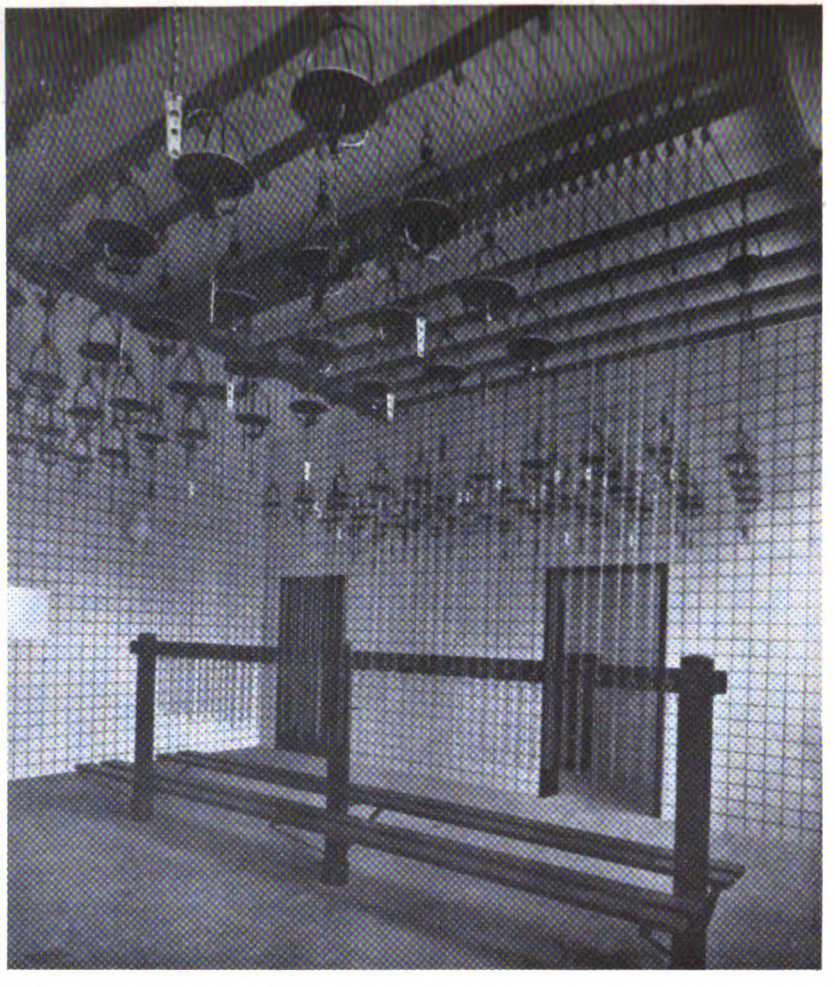

Figure 26. - Locker room of a wash house at a small German coal mine.

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WASH AND CHANGE HOUSES IN GERMANY[4/]

Some of the best wash and change houses at the mines of Continental Europe are in the Rhenish-Westphalian region of Germany. Government-sponsored competition caused the architects to devote much time and study to the design of these facilities, and considerable research was done before the actual construction of these modern wash and change houses was started. Some results of the research and a description of the wash and change houses are given briefly below.

Provision for Clothing

The former practice of providing steel lockers for the clothing of the miner was abandoned, and in all new wash and change houses the clothes are hung on hooks drawn to the ceiling of the hanger room by chains. The free suspension has the advantage that light and air can reach the clothes and can dry the dampest mining clothes. This method is believed to be more hygienic as well as less expensive, as much less floor space is required than when lockers are used (figs. 24, 25, and 26). All new wash and change houses have separate rooms for the mine and street clothes.

Route of Miner through a Wash and Change House

The miner, dressed in street clothes, enters the clean clothes room, undresses, takes his basket containing towels and soap from the hook, and then raises his clean clothes to the ceiling. The miner then walks undressed, but carrying the basket, into the mine clothes room and dresses for work. The basket containing the towels and soap is raised to the ceiling for later use.

On the return from work, the miner enters the "mine clothes" room, undresses, and goes to the shower room, carrying the basket containing the towels and soap. After bathing, he enters a warmer room to dry himself. The miner then goes to the street clothes room, dresses, and elevates the basket with the towels and soap ready for the next day. Treatment under ultraviolet lamps is given the miner - according to medical prescription - after taking the shower bath and before he goes to the street clothes room. The wash and change houses are designed to prevent access to the clean clothes room before the miner has changed his underground clothes and to prevent miners in underground clothes from meeting others in street clothes in the passageways.

Dimensions of Change Rooms

The German architects recommended that large change rooms should be 8 meters high (26 feet) to have proper light; the shower room and toilets 3 to 4 meters high (10 to 13 feet); and the width of the room should not be over 20 meters (65 feet) and the length not over 45 to 50 meters (147 to 165 feet). These dimensions will provide space for about 2,500 hooks, including passageways, benches, etc.

4/ Schönheit der Arbeit (Beauty of Work), Waschkauen; Schönheit der Arbeit im Bergbau: Deutsche Arbeitsfront, Berlin, 1941, pp. 80-115. Translated by S. J. Davenport of the Bureau of Mines.

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Underground clothes hooks need not be spaced more than 40 centimeters (16 inches) apart, but the clean clothes hooks should not be less than 50 centimeters (20 inches) apart.

Shower Rooms

In determining the number of shower heads required, 1 shower bath is provided for every 20 clothes hooks, or if only the largest shift in point of numbers is considered, then 1 shower is provided for each 10 hooks (figs. 27 and 28).

Toilet Lay Out

The toilet is arranged near the shower room or combined with it. For each 100 hooks there is 1 toilet and 1 latrine stall.

Illumination

The German architects recommend that change rooms be lighted artificially, with the lights placed on the long side of the room, preferably 4 to 5 meters high (13 to 16 feet). The distance from the floor to the suspended clothes fixtures essentially determines the height of the lights. The ratio of the height of the light fixtures to the width of the room should not exceed 1:3 to obtain best illumination. If it is necessary to have a greater ratio, lighting fixtures are placed overhead.

ULTRAVIOLET-RAY LAMPS IN WASH AND CHANGE HOUSES

The underground miner works in artificial light for 8 or more hours a day and receives relatively little of the benefits of sunlight on working days. Many mining communities are situated in deep valleys between high mountains; in sections of these localities the sun shines but a short time daily, and in some cases not at all, during part of the winter season. Obviously, the miner misses the benefits obtained from exposure to sunlight; as a result, respiratory ailments are said to be prevalent.

Scientists in the medical profession appear to have found that ultraviolet rays kill bacteria in a room and that persons exposed to the ultraviolet rays react much like they do when exposed to sunlight. Operating rooms of some hospitals are equipped with ultraviolet-ray lamps to further safeguard against infection. With this knowledge and experience as a guide, some of the American and European mining companies have installed a solarium equipped with ultraviolet-ray lamps in the wash and change houses for the benefit of their employees.

A difference of opinion exists in the medical profession as to the relative value of the ultraviolet-ray lamps in the wash and change houses; however, mining-company officials at the mines where the lamps are used continue to advocate their use.

Dr. William T. Anderson, Jr., in an article published in Coal Mining, March 1944, volume 21, No. 3, stated the following in regard to the use of ultraviolet rays in a solarium:

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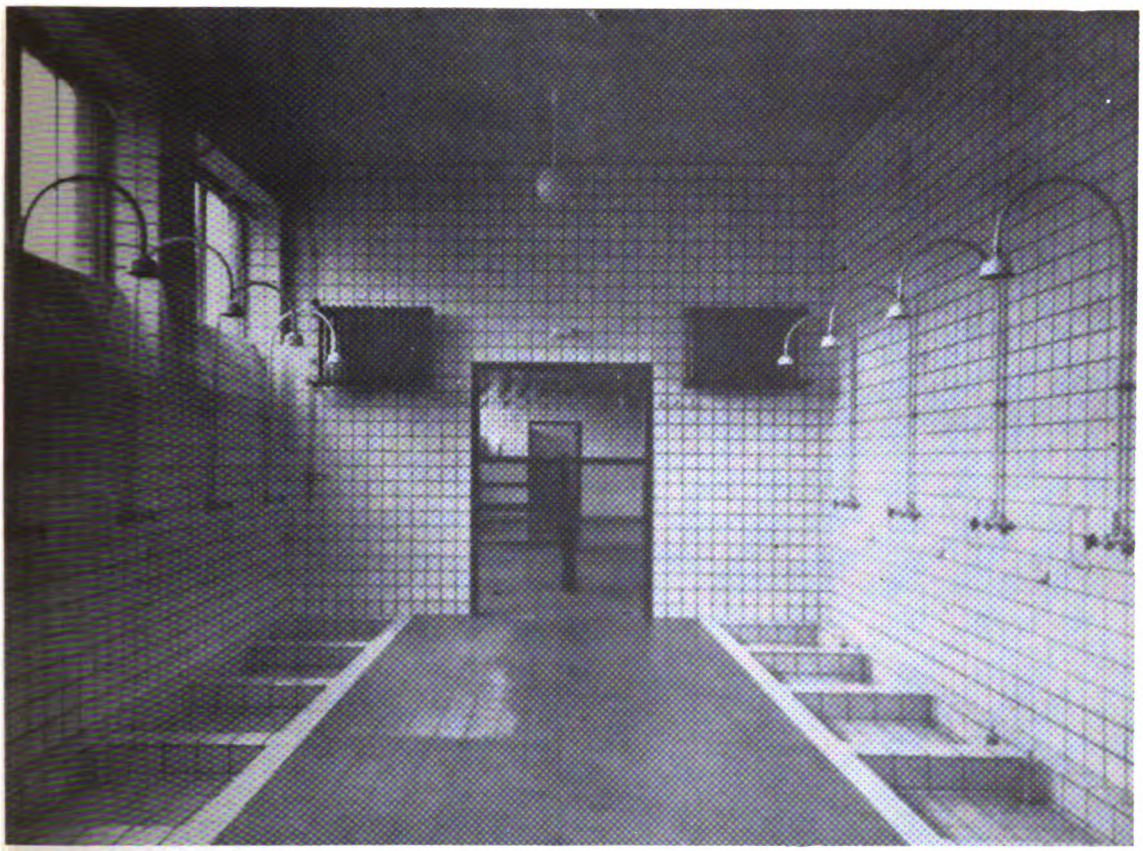

Figure 27. - Individual showers in a foremen's shower room at a German coal mine.

Figure 28. - Shower room at a large German coal mine. The temperature of the water is controlled by an attendant.

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In Sweden, it is reported that the miners gained 134 additional working days per hundred workers during the first year the solariums operated. This was a reversal of the previous trend and contrasted sharply with that of a neighboring mine which did not have ultraviolet solariums.

In Germany it is reported that the Hitler regime in Germany during their preparatory years for war recognized the importance of good health for Germans. As part of their health programs they advocated the employment of sun lamps and installed many solariums at mines and factories. In the Ruhr district alone there were not less than 60 sun ray clinics.

In Great Britain, the British began their preparations for rearmament with due consideration for the health of their workers. Ultraviolet baths under the supervision of a medical officer were recommended in many instances and by 1943 the list of operating installations of quartz lamp solariums read like a "Who's Who" of the British mining and manufacturing industry.

Recent reports have advised that no method of preventing colds is effective, and still observations continue to be made and claims staked that ultraviolet irradiation of the individual does reduce the incidence of colds. The most recent claims have originated in Great Britain. For example, the medical officer of a large factory studied the colds of 1635 employees and tried various preventives, among them ultraviolet irradiation. He concluded that, whereas the average absence due to colds amounted to one hundred and six days per hundred workers, the group which received ultraviolet irradiation with quartz mercury lamps had only sixty six days of absence per hundred persons. Of all the preventives tried, this one alone showed a definite effect. Still other tests made in London, involving 1444 persons, indicated a notable reduction in absences because of illnes, and in particular because of colds, for those who received sun ray treatments under medical supervision in the light clinics.

Allied to but aside from this question, the evidence that the incidence of infections of the respiratory tract may be controlled to a notable degree by ultraviolet air sterilization continues to mount. In addition to hospital experiments, factory installations in the United States have indicated a marked decrease in colds and other respiratory ailments with resulting less absenteeism.

Ultraviolet solariums have been widely used in Russia in the factories; it is claimed that their use has assisted in decreasing absenteeism on account of illness and that a precision worker makes fewer errors and shows less fatigue during periods when he is subjected to light baths than at other times. No reason was given for this alleged improvement.

The claims of benefits derived from the use of ultraviolet-ray solariums at mines in Germany are somewhat unusual. Because of the interest of

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the German Government in increasing the productivity of the worker to reducing the absenteeism on account of illness, extensive laboratory tests were made and the results seem to have been affirmative, as nearly all of the large wash and change houses at the mines in Germany are reported to have been equipped with ultraviolet-ray solariums.

The following are said to be among the benefits resulting from the use of the ultraviolet-ray solariums by the German miners:

1. Increased capacity for work. It is claimed that an increase of 60 percent was obtained in laboratory tests.

2. Reduction in fatigue.

3. Definite lowering of the blood pressure.

4. Definite reduction in respiratory and heart ailment frequency.

American medical authorities are not in accord with these claims; some authorities believe that solariums are an important adjunct to a wash and change house, while others do not believe that they are sufficiently beneficial to warrant their installation.

SOLARIUMS

Solariums vary greatly in design and equipment, but most mining companie that have them seem to prefer to install them as part of the wash and change house between the shower room and the clean-clothes locker room. This location causes a minimum delay to the miner taking the ultraviolet ray treatment at the end of a working shift. In American mines, the use of the solarium by the miners is on a voluntary basis but is encouraged by the mining officials; in some other countries the use of the solarium is mandatory. Figures 29 and 30 show two designs used in laying out solariums; these designs are for group treatments and do not include the moving platform used in many installations.

The cost of the equipment required for a solarium varies greatly, but the following estimates were furnished the Bureau of Mines by an American manufacturer. These estimates do not include the cost of the moving platform and are for group treatment only.

	Class I	Class II	Class III
Capacity, persons per hour...	80 - 100	120 - 160	300 - 400
Space required, feet	7 by 10	7 by 18	18 by 18
Number of persons that can take treatments at one time	4 to 5	8	20
Sun lamps, number	4	8	16
Heat lamps, number	4	10	8
Time required for treatment, approximate minutes	2	2	2
Cost of equipment	$1,400	$2,700	$4,750

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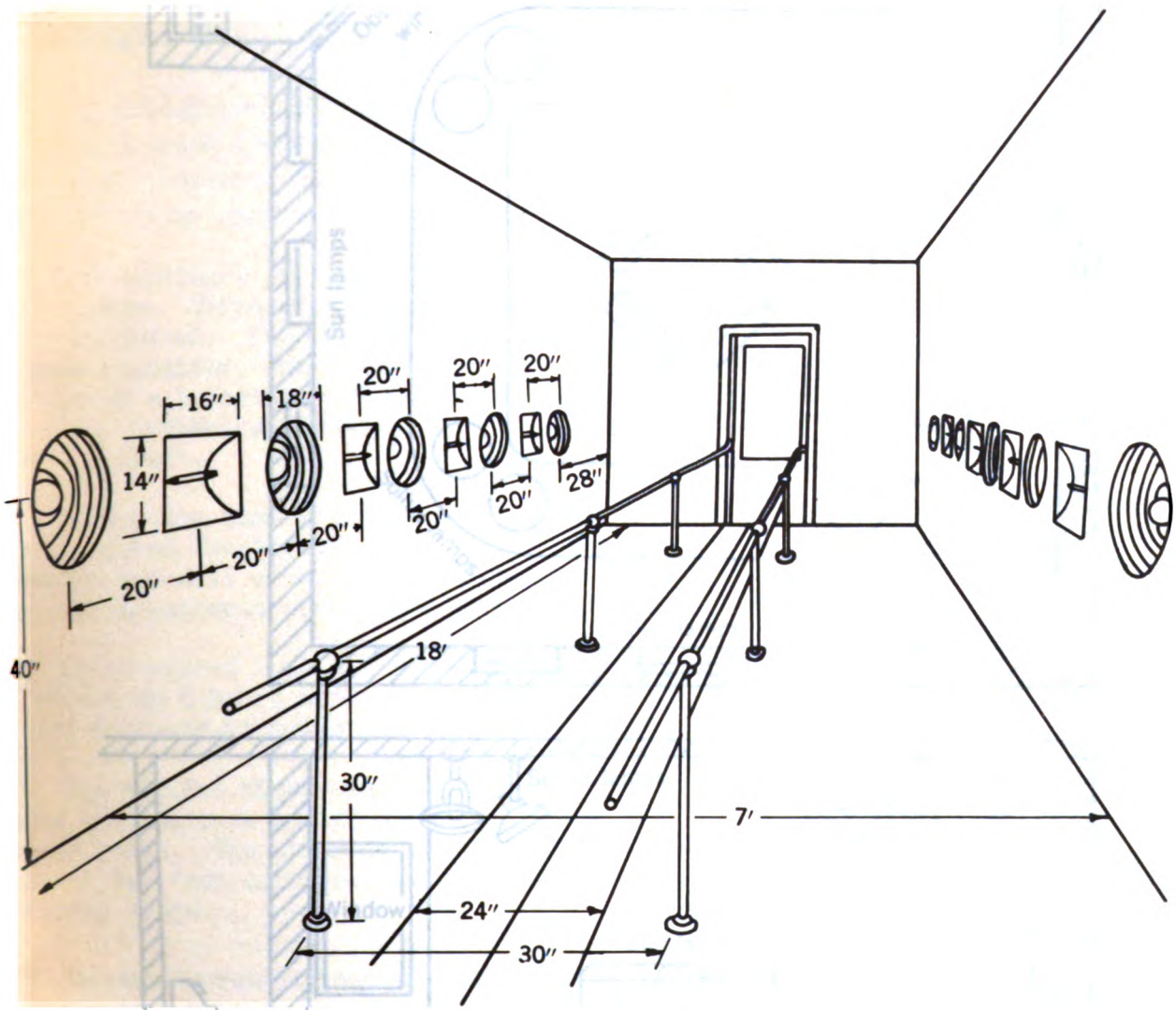

Figure 29. - Solarium - capacity, 120 persons per hour.

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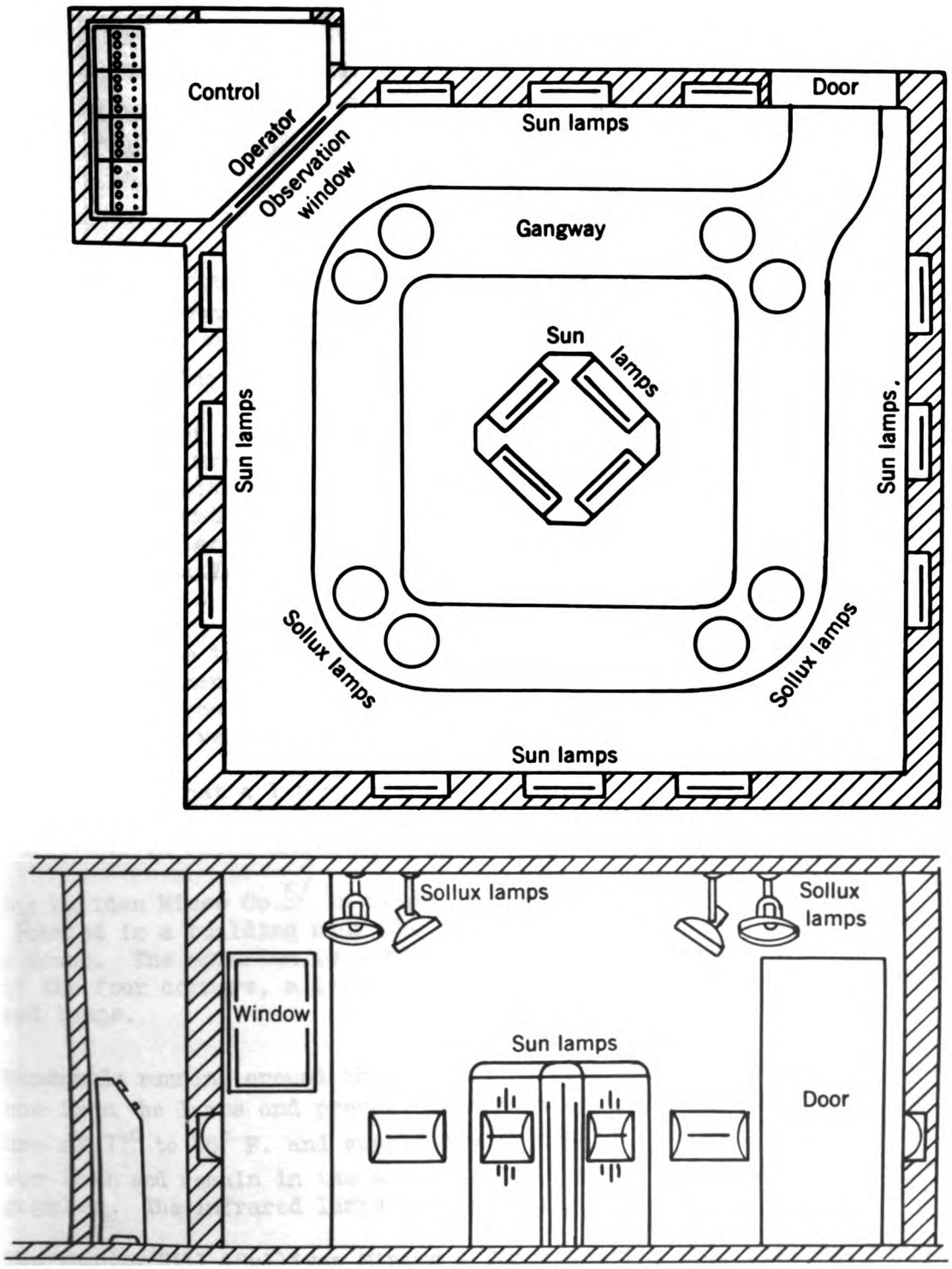

Figure 30. - Arrangement of solarium for group irradiation.

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Examples of Solarium Installations

The Kimberly mine of the Consolidated Mining & Smelting Co. of Canada[5] installed a solarium in 1935. It consists of a cabinet 8.6 feet wide, 8 feet high, and 12 feet long; it is finished in aluminum color to provide the proper diffusion of light and is equipped with a conveyor for carrying the persons taking the treatment through the cabinet. The conveyor speed is controlled to suit the length of exposure required by different individuals.

The conveyor is driven by a 3/4-horsepower motor through a rope drive to a variable speed transmission direct-connected by a flexible coupling to a gear speed reducer. The drive from the speed reducer to the conveyor consists of roller chains and sprockets.

The equipment of the solarium cabinet consists of six 110-volt mercury vapor lamps. Three are on each side of the conveyor and are arranged to give equal radiation. Each lamp is provided with an automatic starter, separate voltage regulator, and voltmeter. The lamps are air-cooled and automatically started by a preheater and relay cut-out; as soon as the arc is established the relay automatically cuts out the heater. The lamps operate at 75 volts direct current.

During the time the solarium has been in use, 92 percent of the men have taken regular treatments. While the advantages of the installation were enjoyed by the mill crew, school children, and the general public in the community, all treatments were given without charge by the company.

It is stated that a 1-minute treatment of these ultraviolet rays is equal in effect to 8 hours sunlight; those using the solarium regularly report a marked decrease in colds and minor winter ailments.

The Boliden Mines Co.[6] in Sweden opened its solarium in December 1937. It is located in a building near the mine shafts and adjoins the wash and change house. The solarium is a rectangular room about 16 by 20 feet. In each of the four cornors, a large, open-reflector quartz lamp is fitted, with infrared lamps.

Handrails running around the center of the room keep the men the correct distance from the lamps and prevent overcrowding. The room is kept at a temperature of 77° to 85° F. and supplied with conditioned air. The miners take a shower bath and remain in the solarium for 3 minutes. It is compulsory to wear goggles. The infrared lamps are primarily for supplying heat.

The Bunker Hill &Sullivan Mining & Concentrating Co., Kellogg, Idaho, installed an automatic solarium in 1929 for the use of the miners and their families.

5/ Minister of Mines of the Province of British Columbia, Annual Report for year ended December 31, 1935.

6/ Ponten, Dr. Johan, Industrial Welfare, January 1940.

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The solarium can handle 300 to 350 cases an hour. It consists of a cabinet 8 feet 4 inches wide, 12 feet long, and 9 feet 2 inches high. Six quartz mercury arc lamps supply the ultraviolet rays. A moving platform carries the persons receiving the treatment through the cabinet at a speed that can be regulated to give the desired exposure.

The solarium is an adjunct of the wash and change house. After taking a shower bath, the men step on the moving platform and take the ultraviolet-ray treatment before dressing in clean, dry clothes. Women and children are allowed to take treatments at certain hours of the day.

FEATURES THAT SHOULD BE INCLUDED IN A WASH AND CHANGE HOUSE

Construction

The building should be of fireproof construction.

Floors

1. All floors should be constructed of concrete and kept free from cracks which may injure the feet of a person while barefoot.

2. Concrete floors should be finished with a nonslip surface.

3. Concrete floors should be sloped to provide adequate drainage to traps leading to drainage pipes or sewers. The drainage should be adequate to remove the water from the floor while washing it with water from a hose.

Entrances

1. The outside doors providing means of ingress and egress from the building should be large enough and in sufficient number to provide an easy passage for a considerable number of employees at the same time without crowding.

2. The doors should be arranged to facilitate air-flushing the building when natural ventilation is used.

3. Revolving doors on outside entrances are recommended as an effective way of preventing drafts.

4. Not less than two exits should be provided.

Arrangement of the Interior

1. The rooms should be of ample size to prevent overcrowding on any shift.

2. The rooms should be so arranged as to be convenient for the employees coming on or going off the shift.

3. Equipment should be concentrated and placed in the order in which it is used.

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Interior Walls

1. The interior walls should be finished with glazed brick, tile, or other smooth surface material at least $6\frac{1}{2}$ feet above the floor.

2. The interior walls should be light in color to aid in better light diffusion.

Sewage Disposal

1. The sewage should be conducted to sewers if available.

2. If sewers are not available, the sewage should be conducted to properly designed septic tanks whenever possible.

3. Sewage should not be discharged into cess pools that are improperly constructed and operated and if there is danger of contaminating the drinking water.

4. Sewage should not be discharged into streams which are used for drinking water farther down stream.

Ventilation

1. The entire building should be ventilated adequately to remove odors, air-borne dust, and humid air.

2. Mechanical ventilation is recommended. It should be controlled automatically and in conjunction with the heating units.

3. The warm air should be introduced from near the ceiling and removed from the building through floor ducts.

4. If natural ventilation is used, a sufficient number of roof ventilators, windows, and vents should be provided to change the air in the building several times daily.

5. Roof ventilators are necessary where natural ventilation is used. These permit the hot, humid air to escape as well as much of the odor from the drying clothes.

6. Windows should be high enough above the floor to prevent persons on the outside looking into the building. The windows should be hinged at the bottom, and means provided for opening and shutting them easily from the floor level.

Heating

1. The temperature of the rooms should be maintained as nearly uniform as possible. The temperature should be between 75° and 80° F. for comfort while the employees are bathing.

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2. The use of unit heaters that blow the warm air into the room from near the ceiling is recommended.

3. If steam or hot water is used for heating, the pipes should be high enough above the floor to prevent body contact, or otherwise they should be screened effectively.

Lighting

1. All rooms should be well-lighted. Generally, both ceiling and wall lights are required.

2. All wiring should be in conduit.

Washing and Bathing Equipment

1. An abundant supply of hot water should be available to provide sufficient hot water for the maximum number of employees on the largest shift.

2. One shower bath should be provided for approximately each 10 men on the largest shift.

3. The showers should be equipped with mixing valves and indicator dials to permit the employees to regulate the temperature of the bathing water.

4. The temperature of the hot water supply should be regulated automatically to prevent overheated water from reaching the shower heads and cause possible scalding.

5. The shower heads should be adjustable to suit the bather.

6. An adequate number of drains should be provided to carry away the water when all the shower baths are in use.

7. Fixed soap receptacles should be provided at each shower bath unless liquid soap is provided. If liquid soap is provided, the soap dispenser should be placed where it will be convenient to the bather.

8. The wash fountains, wash troughs, or wash basins should be placed in the shower room, or adjacent to it, for the convenience of the bathers.

9. Protection against drafts in the shower room should be provided.

10. Heating pipes should be elevated or screened to prevent a contact hazard.

11. The use of bathtubs is not recommended; shower baths are considered more sanitary for groups using wash and change houses.

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Locker Rooms

1. Lockers for street clothes and working clothes should be in separate rooms.

2. The working clothes locker room should be nearest the entrance of the wash and change house that the miner uses when he comes off shift.

3. The use of hooks or hangers attached to chains to elevate the working clothes to the ceiling for drying is recommended. It is believed that this is the most satisfactory method yet devised for caring for wet working clothes.

4. Drying racks should be provided if the working clothes are not elevated to the ceiling by chains. Wet clothes will not dry satisfactorily in the usual type of steel locker.

5. If working clothes are kept in lockers then two lockers for each employee should be provided, one for the street clothes and one for the working clothes. Working clothes and street clothes should never be kept in the same locker.

6. Baskets or other types of containers should be provided for placing the boots, shoes, and hats.

7. Street clothes may be placed in steel lockers or hung on hangers and elevated to the ceiling; both methods are considered satisfactory.

8. Steel lockers should be of the open-mesh type to permit free circulation of the air.

9. Steel lockers should have steeply sloping tops to prevent the storage of materials and personal effects on top of the lockers.

10. The employees using the lockers should be required to keep them clean.

11. Steel lockers should be set permanently in an elevated position above the floor, leaving sufficient space under the lockers so that the floor can be washed using a water hose.

12. If either street or working clothes are raised by chains to the ceiling, rings or other means should be provided whereby the chains can be securely locked in position.

13. If combination locks are provided for lockers, both locks should have the same combination.

14. Fusible links in the chains used to elevate the clothes to the ceiling are recommended as a fire preventive measure.

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Benches

1. A sufficient number of benches should be provided in the locker rooms for the use of the employees while changing clothes. Generally, it is advisable to have the benches extend the full length of the tiers of lockers.

2. The benches should be attached permanently to the floor; no obstructions should be permitted under the benches that will prevent cleaning the floor with water from a hose.

3. The benches should be about 12 inches wide and 15 inches high and supported on steel legs. The supports should be spaced not more than 6 feet apart. The top of the bench should be of wood that is finished smoothly and free from splinters.

Lavatories

1. All wash and change houses should be equipped with lavatories.

2. At least 1 toilet seat should be provided for each 100 persons employed; the toilets should flush automatically when the seat is released. The open-type toilet seat is recommended.

3. Toilets should be placed in a separate, well-ventilated room.

4. All toilets should be washed after each shift and should be cleaned with cresol or chloride of lime at least once each week.

5. Urinals of the individual or trough type should be provided.

6. Urinals should be washed at least once each day and should be cleaned with cresol or chloride of lime at least once each week.

7. Urinals of the trough type should slope towards the drainage end three-fourths of an inch to each foot in length; the urinal should flush continuously.

8. The back of the urinal should extend at least 15 inches.

Drying Racks

1. Drying racks should be constructed of iron. Wooden racks increase the danger from fire.

2. At least two rows of steam pipes should be used to dry clothes thoroughly.

3. Ventilating hoods should be placed over the top of the drying racks. The hot humid air and the odors from the drying clothes should be removed from the hoods through pipes connected to an exhaust fan.

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Laundry Tubs

1. Laundry tubs should be placed in all wash and change houses as an incentive to the miner in keeping his underground clothes clean.

2. Washing machines are desirable; but if none are installed, 6 laundry tubs should be provided for each 100 men.

3. Provision should be made to have an abundance of hot and cold water in the laundry room.

4. Wash boards should be available unless washing machines are used.

First-Aid Room

1. A well-equipped first-aid room should be a part of or adjacent to every wash and change house.

2. The first-aid room should be equipped with wash basins and supplied with hot and cold water.

Boot Washing Station

1. A boot-washing station should be provided outside the locker room for working clothes. The miners should be encouraged to wash the dirt from their boots before entering the locker room.

2. Provision should be made to dispose of the dirt accumulations washed from the boots.

Sanitation

1. Wash and change houses should be cleaned thoroughly after each shift. Floors and lavatories should be cleaned with a hose; and wash fountains, basins, or troughs should be cleaned with a strong soap powder or with kerosine.

2. Toilets, urinals, and washing facilities should be cleaned with cresol or chloride of lime at least once each week.

3. Shower heads and plated metal parts such as faucets, valve handles, and soap receptacles should be scoured with soap powder or kerosine at least once each week.

4. The top and inside of steel lockers should be washed with kerosine at least once every 2 weeks.

5. Windows and electric light bulbs should be kept clean.

Caretakers

1. At least one caretaker should be assigned to work in the wash and change house on each shift.

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2. It is generally considered desirable for the caretaker to be trained in first-aid work.

Travelway Between Mine Entrance and Wash and Change House

1. A travelway between the mine entrance and the wash and change house is desirable. This travelway may be a tunnel connection or a covered walkway.

2. The travelway should be heated and well-lighted.

3. Benches should be installed in the travelway for the miners to use while waiting to go on shift.

Carbide Storage

1. Carbide should not be stored or dispensed in a wash and change house.

2. A waste carbide receptacle should be placed at the entrance to the wash and change house at those mines where miners use carbide lamps. Miners should be required to empty the spent carbide into the receptacle before entering the wash and change house.

Foreman's Office

It is desirable to have the office of the foreman and shift bosses in or adjacent to the wash and change house. This is a convenience for both the miner and the supervisors as well as permitting cheaper construction of the foreman's office since the plumbing is concentrated in one building.

CONCLUSION

By all means every foresighted mining company should provide an up-to-date wash and change house for its employees and make certain that it is maintained at all times in a clean, sanitary condition. The fact that the mining law does not require the installation of a real wash and change house, as is frequently the case, is not even a remotely reasonable excuse for not helping the mine worker to maintain his health and self-respect. Moreover, recruits for the mining industry are becoming more and more difficult to obtain, and the availability of a reasonably effective wash and change house may be of material aid to a mine in obtaining desirable workmen.

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